ELECTRICAL REVIEW

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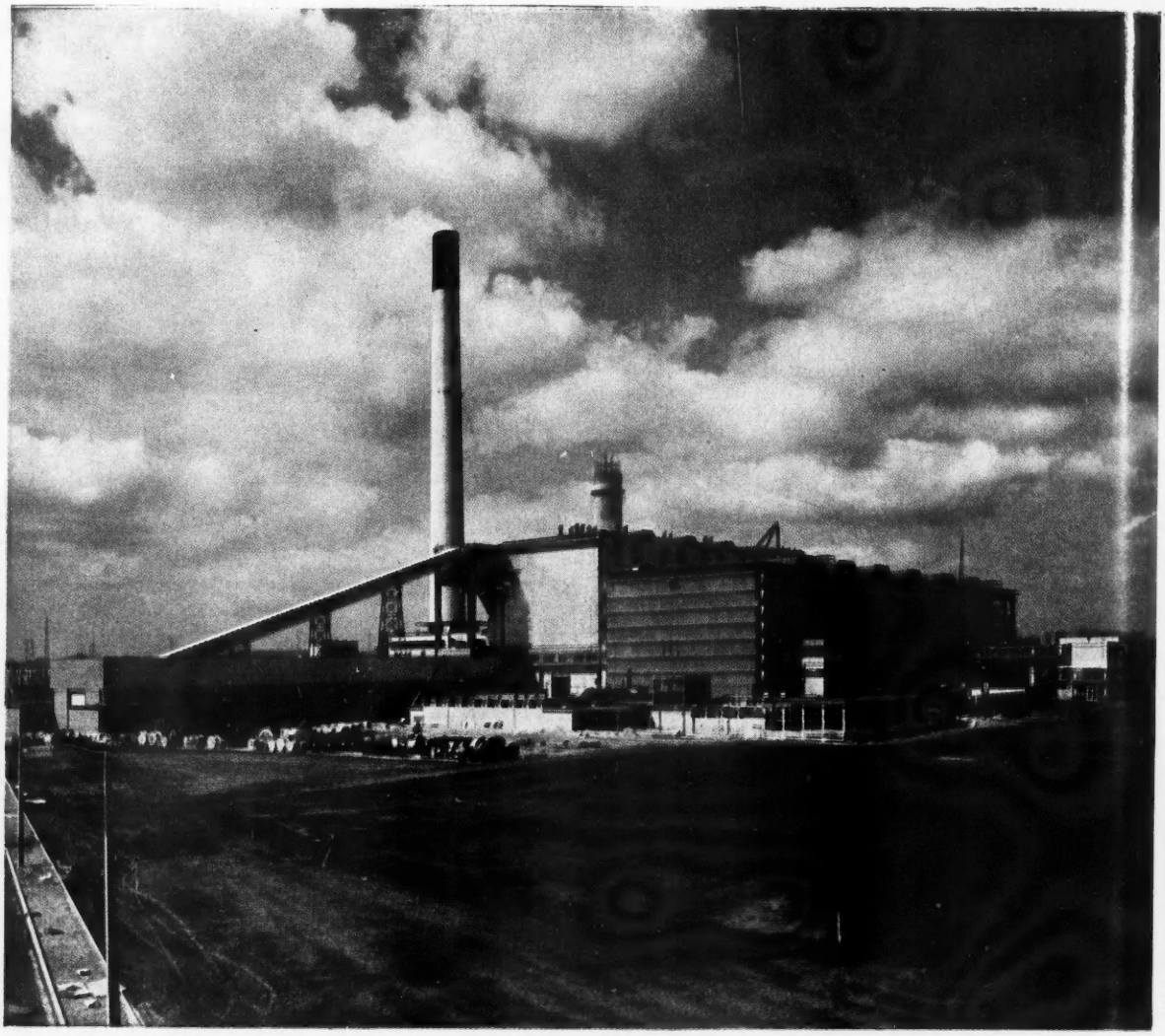

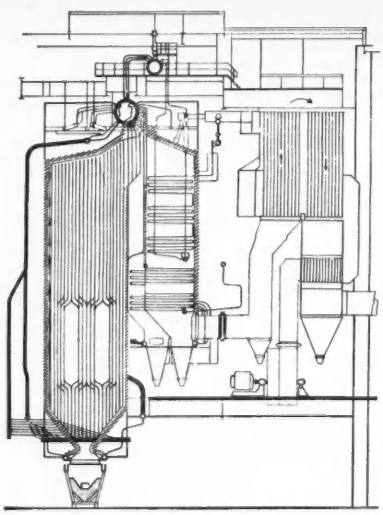

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8 FEBRUARY
1957

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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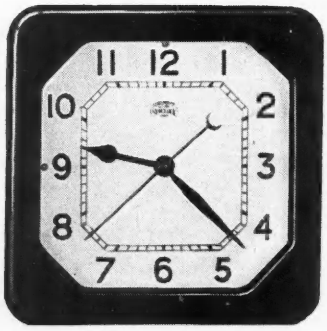

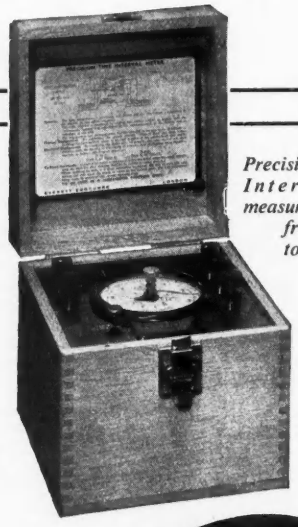

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ELECTRICAL REVIEW

8 February 1957 Vol. 160 No. 6 Established 1872

Area Board Organisation

WHEN it was decided to nationalise the electricity supply industry the Organising Committee set up in advance found itself involved in the task of welding together about six hundred more or less separate undertakings. The 1947 Electricity Act had already laid down a general framework of fourteen Electricity Areas controlled by separate Boards but it was too much to expect these Boards to handle directly all the detail work which amalgamation and subsequent operation meant. It was decided therefore that each Area should be divided into a convenient number of Sub-Areas each of which would have under its jurisdiction a number of Districts based broadly on existing undertakings' territories. Thus arose the so-called " three-tier " organisation of the industry.

This arrangement was one of the matters examined by the Herbert Committee of Inquiry into the Electricity Supply Industry. The Committee formed the opinion that under the three-tier system District managers were given little encouragement to feel personal responsibility or pride in the business success of their Districts. The Districts, said the Committee, should be a training and testing ground for higher managerial posts throughout the industry, whereas under the three-tier system there were only five or six truly managerial posts in an Area.

The Committee carefully said that it did not wish to limit the discretion of each Board to determine the best form of internal organisation for its particular circumstances but it put forward some conclusions for the Boards' consideration. Among other things, the Committee thought that there should be only one management level below Board headquarters, that the number of "genuine management districts" should be increased to 15 or 20 in each area and that the district manager should be given the opportunity and facilities to " run his own show."

In point of fact two of the Boards have already departed from the general pattern. The East Midlands Area now consists of seven Sub-Areas and five " Managed Districts " directly responsible to Board headquarters. In London the process began about four years ago and up to now the Area has consisted of five Sub-Areas and four " two-tier " districts directly responsible to headquarters. Last week it was announced that the reorganisation would be completed this year and the Area would then be divided into eighteen " Managed Districts," the Sub-Area organisations disappearing.

So far we have heard nothing of impending reorganisation of other Boards' areas; indeed at a recent meeting the secretary of the South Eastern Board said that his Board had no intention of dispensing with its Sub-Areas. The new Electricity Bill is not concerned with this subject but it might be well for other Boards to delay action for the time being until the industry has settled down after the coming drastic alterations at the top of the industry.

DEFERRED STATEMENT

Events in the Middle East have forced us to view with greater urgency the development of atomic energy to make up the anticipated gap in our future fuel supplies. There is a general conviction that the programme outlined in the 1955 White Paper will be quite inadequate and it is even now being exceeded in so far as the nuclear power stations already contracted for will each have something like double the capacity originally contemplated. We were told in November that the then Minister of Fuel and Power (Mr. Aubrey Jones) was to make an official pronouncement on nuclear power development but it was postponed and now there is a new Minister (Lord Mills) who is still expected to reveal the Government's plans.

All those concerned with the subject—a growing number and largely in the electrical industry—are anxious to lay their plans for the future and the statement on the nuclear power programme should not be delayed much longer. In the meantime, though, things are not standing still and the "atomic" groups are obviously resolved to have the first three stations running in record time.

SMALL NUCLEAR PLANTS

An announcement last week that a British company was collaborating with an American concern in the building of nuclear power stations of 10 MW capacity created a considerable stir in the daily Press. *The Times* went so far as to say that the plants "were placed on the market by a British firm yesterday." There are several noteworthy points in the arrangement. The reactors employ enriched uranium and pressurised water is used as the moderator and heat-transfer medium; the uranium is to be supplied by the U.S. Atomic Energy Commission.

At the quoted price of £2 million for a 10 MW station the capital cost of a station of this type will be £200/kW compared with the £110-£120/kW of the three stations about to be erected in Great Britain. It is stated that the cost of electricity generated will be between 1½d and 2d/kWh, which is about double that anticipated in the case of the "Calder Hall" type stations. But as these compact nuclear plants are designed particularly for areas in which the provision of coal or oil-fired plant would be very expensive they will probably be quite competitive.

Most of the work in connection with the stations will be carried out in this country. This is all to the good, but we still await an announcement that small British designed and constructed reactors suitable for export will be available in the near future.

ELECTRICITY AND FIRE RISKS

"Electricity is such a familiar and readily available form of energy that we often forget the risks involved in its use. Statistics show that the number of fires caused by electricity in industrial and commercial premises is steadily growing, though many of these could have been prevented by simple and commonsense precautions." This is part of a foreword by Sir Norman Kipping, director-general of the Federation of British Industries, to a new booklet published by the Fire Protection Association "Electricity and the Fire Risk in Industrial and Commercial Premises."

Because of the outstanding importance of the subject we welcome this booklet which has been prepared with the guidance and assistance of a panel of representatives of the electrical industry and of fire protection experts. It deals with the general aspects of the problem and with some of the causes of electrical breakdown which may result in fire. Electrically the contents of the booklet are elementary, but no doubt both those who install and those who use electrical equipment are often guilty of carelessness or take unnecessary risks in elementary matters.

TRAINING OF GRADUATES

At a recent Press conference arranged by the Joint Committee on Practical Training at the Institution of Electrical Engineers on the subject of the training of graduates, stress was laid not only on the importance of practical training for graduates but also on the very great need for more professional electrical engineers. Many of the larger concerns have long provided practical training for graduates far in excess of their own particular requirements and it is felt that they will not be able to cater for the rapidly expanding demands.

The Committee, which is representative of all the main sections of the industry, strongly recommends that all concerns which do not provide facilities for practical training for graduates should endeavour to devise satisfactory training programmes, either by participating in group schemes or by securing the co-operation of larger firms. The importance of providing practical training for graduates from overseas was stressed since many of these men return to their own countries and reach senior positions in industry. When regard is paid to the position of the electrical engineering industry as an exporter and to the future demands which will be made on the electronics section of the industry alone because of automation, there is no doubt about the importance of the proposals put forward by the Joint Committee.

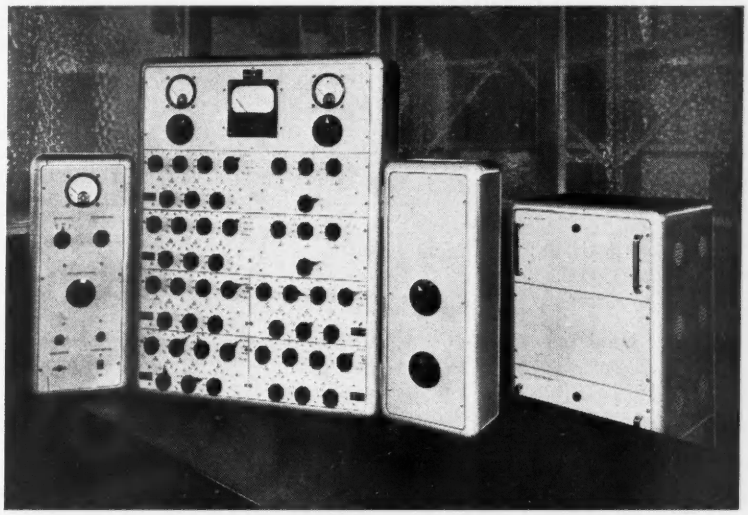
ENGINEERING WAGES

Although it seems that the Engineering Employers' Federation adheres to its original answer to the unions' claim for a 10 per cent rise in wages—that in present circumstances an increase is inadmissible—it has agreed to hear the renewal of the claim in a week or two's time. Reports suggest that the claim is being based not so much on the rise in the cost of living since the last increase was granted as upon the possibility of an early future rise in the index as an outcome of the Suez affair. Another argument is that increased wages are being paid in other industries: to this the employers are expected to reply that these increases have been principally in "sheltered" industries. Conditions in world markets are such that any further increase in British export prices—and engineering products are largely exported—would lead to a serious loss of trade.

MOTOR DESIGN TECHNIQUES

Use of an Analogue Computer

By J. F. LEVY, B.Sc.*



General view of computer. On the left are the six impedance units with input circuits, instruments and selector switches. On the right are the amplifiers

TWO of the many problems which face the electric motor designer are the predetermination of the performance characteristics of a given design, and the evaluation of the motor constants for the theoretical determination of its performance. The designer must calculate the resistance and leakage reactance of the stator and rotor windings, the magnetising reactance, and the losses which are inherent in any magnetic circuit, i.e. the core loss due to eddy currents and hysteresis. Having determined these circuit constants the designer represents the motor by an equivalent circuit and solving this circuit determines the expected performance.

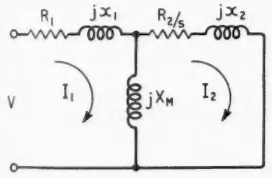


Fig. 1.—Equivalent circuit of three-phase induction motor (core loss neglected)

If the resultant design is unsuitable and the performance figures are not what is required, he alters the design and repeats the process until satisfactory results are obtained. Both these processes involve laborious calculations, and efforts have been made to mechanise the calculation procedure. Consider as an example a three-phase induction motor. Having calculated the machine constants, the designer represents the motor by the equivalent circuit as shown in Fig. 1 (core loss neglected). Here

R_1 = Stator winding resistance
x_1 = Stator winding leakage reactance
R_2 = Rotor winding resistance
x_2 = Rotor winding leakage reactance
Xm = Magnetising reactance
s = Slip $= \dfrac{\text{Nsyn}-\text{Nact}}{\text{Nsyn}}$
Nsyn = Synchronous speed
Nact = Actual speed

This equivalent circuit is evaluated for various values of slip from no load to starting and currents I_1 and I_2 are determined; hence the power input, power output, torque efficiency and power factor are ascertained. A typical set of curves showing the expected performance is shown in Fig. 2. Even in this simple case the solving of the equivalent circuit is a comparatively long process especially as complex numbers are used. To facilitate the solution, a network of resistances and reactances can be connected to represent the equivalent circuit and thus the currents and power can be directly measured. The calculation of the efficiency and torque then becomes a simple procedure. (This can be done on a network analyser such as the A.E.I. analyser at Willesden.)

Equations

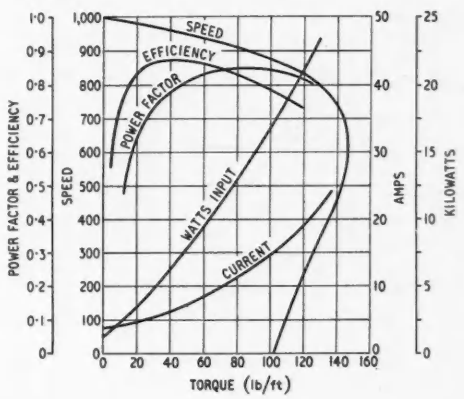
The performance of the three-phase motor can also be represented by the following two equations, again neglecting core loss.

$$V = I_1[R_1+j(x_1+Xm)]+I_2jXm$$
$$O = I_1sjXm+I_2[R_2+js(x_2+Xm)] \quad \ldots\ldots\ldots (1)$$

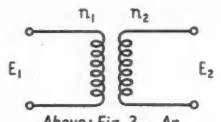
Torque = Real Part $I_2^*(-jXm)I_1$ synwatts/phase

where I_2^* is the conjugate of I_2 and the symbols represent the same quantities as those in Fig. 1. Equations (1) and the equivalent circuit of Fig. 1 are mathe-

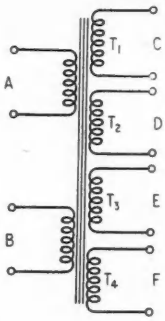
Fig. 2.—Typical set of curves showing motor performance



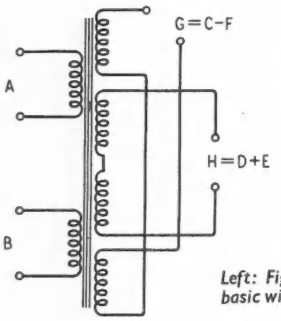
* B.T.H. Motor Engineering Department, Rugby.



Above: Fig. 3.—An elementary transformer

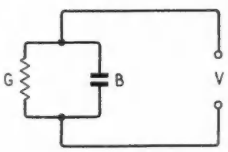


Above: Fig. 4.—Basic windings for computer unit



Left: Fig. 5.—Interconnection of basic winding to form impedance unit

Right: Fig. 6.—Parallel circuit where G = conductance and B = susceptance



matically identical. These equations can be solved for I_1 and I_2 and hence the performance curves determined.

Digital Computers

The solution of these equations can be performed on a digital computer. A digital computer is an electrical means of performing the basic functions of arithmetic, and it is able to store information at any time and to use this information when desired.

The digital computer has many advantages over the direct representation type of analyser in its speed of operation and its ability to store information. But unless a large number of similar problems are to be solved, the cost and time of preparing the calculation for the computer become prohibitive. On the other hand, while the network analyser simply solves a network problem after the circuit constants have been evaluated, the digital computer can sometimes evaluate these circuit constants as well.

However, the cost of operating and maintaining a digital computer puts its use outside the scope of the design office, for everyday problems. In many cases the designer has to use an existing frame size where all the information has already been evaluated, and wishes to make, say, a modification to the number of turns in order to increase the starting torque. To use a digital computer for one calculation of this nature would be impracticable and the direct representation type is preferable.

Analogue Computers

The method of representing an equivalent circuit by actual resistances and reactances can be used only in such simple circuits as the three-phase induction motor and even then the accuracy is limited in that resistance-free inductances are difficult to manufacture and there is always an inherent error. In order to overcome the former difficulty, analogue type computers have been developed. An analogue computer is one in which resistance, inductance and capacitance are represented by some other means. One method of doing this would be to use electronic circuits and another to use ideal transformers. These are termed electronic simulators or transformer analogue computers respectively.

As far as the author is aware simulators are not generally employed to solve electric motor problems, but they are used for power system analysis, and general engineering problems, especially for the solution of differential equations encountered in servo systems. By virtue of its extreme versatility the transformer analogue computer is being used and developed for the solution of machine design problems.

In effect the transformer analogue computer is a direct representation type analyser but has the advantage of being capable of solving equations.

One type of motor is of particular interest, i.e. the permanent split motor (the capacitor motor). The equivalent circuit derived using the double revolving field theory is complex, as two circuits are involved and there is interaction between the two circuits. Circuits where voltages must be transferred from one circuit to another cannot be easily represented on the a.c. network analyser. Circuits using direct representation calculators have been developed, but the currents and voltages, measured and applied, are not actual values and must be converted. The transformer analogue computer on the other hand can easily represent this type of circuit. Further simplification is afforded in that the transformer analogue computer can solve equations. However, the accuracy is not as good when solving equations, so networks are developed which represent combinations of an equivalent circuit and a set of equations.

Transformer Analogue Computers

Consider an elementary transformer (Fig. 3) where

n_1 = No. of primary turns

n_2 = No. of secondary turns

E_1 = primary e.m.f.

E_2 = secondary e.m.f.

$$E_1 n_1 = E_2 n_2 \quad .. \quad .. \quad .. \quad .. \quad .. \quad (1)$$

$$E_1 = \frac{n_2}{n_1} E_2 \quad .. \quad .. \quad .. \quad .. \quad .. \quad (2)$$

The analogy to a resistance is seen by considering Ohm's Law.

$E = IR$

E is analogous to I

n_2/n_1 is analogous to R

If the turns ratio represents R, the measure of the voltage E_2 is an indication of the current that would be flowing in an equivalent resistance. The transformer is also a multiplier unit ($A = B \times C$) where E_1; $\frac{n_2}{n_1}$; and E_2 can represent any quantities.

In alternating current problems, complex quantities $A + jB$ are always encountered (j indicates a rotation through 90 deg). Consider a voltage $\dot{V}$ applied to a resistance–reactance network, resulting in a current $\hat{I}$. $\dot{V}$ and $\hat{I}$ are both vector quantities.

$$\dot{V} = (R + jX)\hat{I}$$

Splitting $\dot{V}$ and $\hat{I}$ into in-phase and quadrature components

$$(V_p + jV_q) = (R + jX)(I_p + jI_q) \quad .. \quad .. \quad (3)$$

$$= (RI_p - XI_q) + j(RI_q + XI_p) \quad .. \quad (4)$$

$$\therefore \quad V_q = RI_p - XI_q \quad .. \quad .. \quad .. \quad (5)$$

$$V_q = RI_q + XI_p \quad .. \quad .. \quad .. \quad (6)$$

The problem is to represent the complex quantities. If two transformers, each with three windings, are used, Fig. 4 is obtained. T_1 T_2 T_3 T_4 are the turns ratio of the

transformers. If voltages A and B are applied to the transformers, the voltages measured are C, D, E, and F.

$$\text{Where} \quad \left.\begin{aligned} C &= T_1A \\ D &= T_2A \\ E &= T_3B \\ F &= T_4B \end{aligned}\right\} \quad .. \quad .. \quad .. \quad (7)$$

If the windings are connected as in Fig. 5 the following is obtained.

$$G = C - F \quad .. \quad .. \quad .. \quad .. \quad (8)$$
$$H = D + E$$

From (7)

$$G = T_1A - T_3B \quad .. \quad .. \quad .. \quad .. \quad (9)$$
$$H = T_2A + T_4B \quad .. \quad .. \quad .. \quad .. \quad (10)$$

The analogy between (9) and (10) and (5) and (6) can be seen if applied voltages A and B are called I_p and I_q and measured voltages are called V_p and V_q.

If ratios T_1 and T_3 represent resistance and T_2 and T_4 represent reactance, equations (9) and (10) are rewritten

$$\left.\begin{aligned} V_p &= RI_p - XI_q \\ V_q &= RI_q + XI_p \end{aligned}\right\} \quad .. \quad .. \quad .. \quad (11)$$

In fact voltages G and H are applied (i.e. V_p and V_q) and the voltages A and B measured, these being the in-phase and quadrature components of currents which would flow in a series R + jX circuit. As before the two transformers represent a complex number multiplier.

By interchanging connections between windings the two transformers represent resistance, reactance, capacitance, and negative resistance, or any combination of these quantities.

If voltages are applied to A and B and the voltages measured at G and H are called currents, the following equations can be written

$$\left.\begin{aligned} I_p &= V_pT_1 - V_qT_2 \\ I_q &= V_qT_3 + V_qT_4 \end{aligned}\right\} \quad .. \quad .. \quad .. \quad (12)$$

Consider a parallel circuit as shown in Fig. 6

$$I_1 = (G + jB)V$$
$$(I_p + jI_q) = (G+jB)(V_p+jV_q)$$
$$= (GV_p - BV_q) + j(GV_q + BV_p)$$
$$\left.\begin{aligned} I_p &= GV_p - BV_q \\ I_q &= GV_q + BV_p \end{aligned}\right\} \quad .. \quad .. \quad .. \quad (13)$$

(12) and (13) are analogous if $T_3 = T_1 = G$, $T_4 = T_2 = B$

Thus the standard impedance unit serves as an admittance unit by simply interchanging input and output terminals. This may be done using a switch. In this way the range of a unit is extended. As an impedance unit (1,000 turns on secondary and primary) values of resistance and reactance from 0·001 to 0·999 and as an admittance unit values of 1·001 to 1000 (i.e. $\frac{1}{0{\cdot}001}$ to $\frac{1}{0{\cdot}999}$) are obtained giving an overall working range of a million to one.

The obvious advantage of the transformer analogue computer (T.A.C.) is that by representing reactance and capacitance by transformers they are pure elements (resistance-free). The fact that negative resistance is obtainable from a standard unit is another decided advantage. In a direct representation type, negative resistance is obtainable only by using a generator or an electronic valve circuit. The negative resistance in the T.A.C. can be used to represent a generator. A typical standard unit is shown in Fig. 7.

Method of Circuit Connection

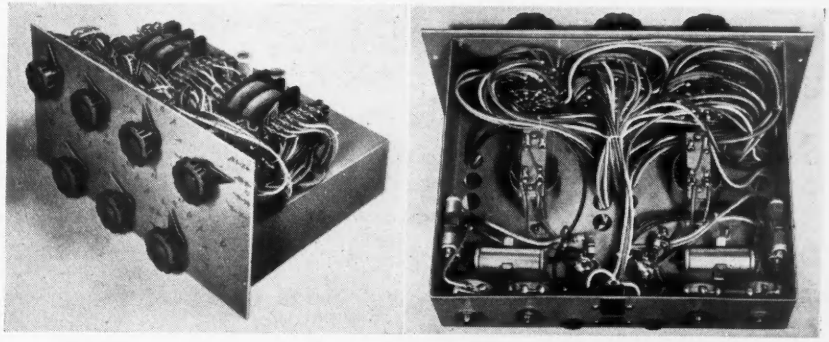
Series and/or parallel interconnection of units are obtained as follows:—In a series circuit, all elements carry the same current and hence the current coils of the transformer units are connected in parallel. The total voltage across a series circuit is divided proportionally to the impedance of each unit: hence the voltage coils are connected in series.

Similarly, for a parallel circuit the current coils are connected in series and the voltage coils in parallel. By suitable interconnection of two standard units, voltage or current transformation, or symmetrical or asymmetrical mutual inductances are obtained.

The main difficulty with the transformer analogue computer is obtaining " ideal " transformers. It has been assumed that the ratio of input to output voltage is dependent only on the turns ratio. However, this is not the case; in fact $V_1 = V_2\left(\frac{n_2}{n_1} + a\right)$ where a depends on the magnetising current and the impedance of the windings. An ideal transformer (i.e. where a = 0) is one which has no internal loss, requires no magnetising current and has perfect coupling between windings (no leakage flux). By careful design and construction the transformers used have the minimum leakage flux. By use of special compensation circuits the magnetising current has been reduced to the minimum which reduces the error in voltage transformation to negligible proportions. The compensation circuit is connected at the rear of the impedance unit as shown in Fig. 8.

The computer shown is connected to represent either a single-phase (induction run) motor or a three-phase motor. By using special interconnection boxes, other circuits are obtainable, e.g. frequency changer or double squirrel cage motor.

The stator impedance is represented by two units in series. This is done so that if high stator impedance is encountered the value can be split between the two units. The magnetising reactances and resistances representing core loss are permanently connected as admittance units, since these values are generally far greater than the remaining circuit constants. The rotor impedances are represented by two impedance units. A special feature of the rotor units is that special provision is made for the representation of slip by using extra transformers. The input



Left: Fig. 7.—Standard impedance unit and (right) Fig. 8.—Underneath view of impedance unit showing compensation circuit in foreground

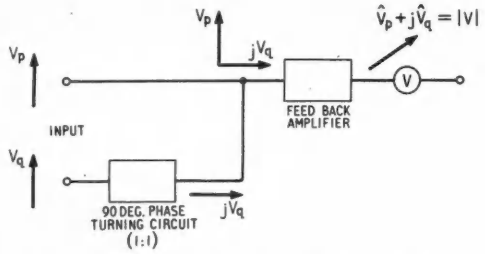


Fig. 9.—Schematic arrangement of phase turning and measuring circuit

is from the 50 c/s mains through a voltage stabiliser circuit, a variac and a fine adjustment control.

The units are permanently connected to form the equivalent circuits by a connection board at the rear of the switching panel. Two selector switches on this panel are to select the quantities to be measured, and determine whether in-phase or quadrature components are measured.

The various quantities, amps, volts and watts, are measured on instruments shown on the centre panel. The amplifier circuits are in a separate cubicle. Using these amplifiers ensures that the measuring circuits draw no current from the supply.

It should be noted that the in-phase and quadrature components are derived separately. These quantities can be measured separately and then combined vectorially, or the quadrature component can be passed through a phase turning circuit and then combined with the in-phase component before measuring as shown in Fig. 9.

Theoretically the transformer should not carry any current at all; all quantities whether they represent current or voltage are in effect voltages. However, in practice a current does flow, but this is limited (in the case of a single unit to 120 μA) and does not affect the accuracy of the results to more than 1 per cent.

A typical problem which requires a fair amount of calculation is one in which the circuit constants change with speed, e.g. the leakage reactance of a three-phase motor varies considerably from standstill to light running. The process of determining this variation is one of trial and error.

First assume a value of leakage reactance and calculate the currents; then adjust the value of reactance to that corresponding with the new current and again calculate the current. This procedure is repeated until the value of leakage reactance which corresponds to a given current results in this current flowing in the circuit. The use of the computer speeds up this process, as the currents in a particular branch, e.g. in the rotor, can be measured without referring to any other branch as would be necessary in the manual solution of a circuit.

The principle of the transformer analogue computer is due to Blackburn and Mallock. The computer as described is based on the work done at Imperial College, London, by M. W. Humphrey Davies and colleagues and was designed and constructed by the B.T.H. Test Department in conjunction with the company's motor engineers. The author wishes to thank Mr. Pringle, manager of the Motor Engineering Department, and the directors of the British Thomson-Houston Co., Ltd., for permission to publish this article.

REFERENCE

"Transformer Network Analysers"—M. W. Humphrey Davies and G. R. Slemon. *I.E.E. Proceedings*, Vol. 100, Part II, No. 77, October, 1953.

NEW ATOM SEPARATOR

A NEW machine which can separate groups of slightly different atoms from the mixture of twin-like atoms (or isotopes) of which a single element is usually formed, has now begun to operate at Harwell. Its name, HERMES, is derived from the full title of heavy element and radioactive material electromagnetic separator.

Groups of atoms which are chemically identical are separated from one another in the machine by accelerating a beam of electrically charged atoms through regions where electrical and magnetic forces cause groups of them differing slightly in weight to follow different paths through the machine.

The purpose of HERMES is to give separate radioactive isotopes. The machine and its ancillary equipment are consequently specially designed to handle highly toxic and radioactive materials. It is the largest and most complex machine in Western Europe yet built into a sealed space. In effect, it is enclosed in a "glove box" (a device in which poisonous and radioactive materials can be handled in complete safety, already used widely in atomic energy work).

Servicing and maintenance of the machine is carried out by skilled "frogmen" in heavy rubber suits, who enter through a corridor. The sealed building in which the separator is enclosed measures 21ft by 25ft by 14ft high. The machine is operated from a nearby control room. Investigation of the fundamental nuclear properties of separated radioactive isotopes is of great importance, not only in extending the knowledge of nuclear physics, but also in providing data often vital for the development of advanced reactor technology. HERMES will be used, for example, to assist in the precise measurement of the nuclear properties of the various types of plutonium which may be generated in a nuclear reactor. It is capable of separating isotopes of plutonium in milligram range quantities, and may be used to separate radioactive isotopes of other elements.

The new machine was designed and constructed at the Atomic Energy Research Establishment and the contractors included the following:—Honeywell Brown, Ltd., temperature regulating equipment; English Steel Corporation, Ltd., magnet; London Transformer Products, Ltd., magnet coils; Pressed Steel Co., Ltd., refrigerating equipment; A. & E. Lintott, Ltd., control desk; the Pyrene Co., Ltd., CO_2 installation; the Power Centre Co., Ltd., trunking; W. G. Pye & Co., Ltd., closed loop television equipment; Ernest Turner & Co. (Salford), Ltd., metering instruments; Ediswan Valve Co., triode regulators; Standard Telephones & Cables, Ltd., diode monitors and rectifier valves; and Steatite & Porcelain Products, Ltd., special insulators.

Hearing and Seeing

AT an informal evening arranged by the Radio and Telecommunication Section of the Institution of Electrical Engineers on 4th February Dr. E. C. Cherry discussed the importance to the future of electronic engineering of research in hearing and seeing. An understanding of human perceptions, he said, might change the engineer's ultimate object so that it became not so much the transmission of waveforms faithfully as of clues necessary to transmit the desired illusions. Statistical laws could be formulated to describe human behaviour. Further, subjective effects were measurable objectively, i.e. repeatably and predictably, by statistical means. Knowledge of the brain processes would help towards the design of speech-compression systems, though not necessarily by direct imitation of such processes.

INDUSTRIAL DE-RATING

Is Repeal Imminent?

By JOHN C. HANCOCK*

THE Rating and Valuation Bill introduced into the House of Commons at the end of December aims, among other things, at reducing from 1st April next the assessments of commercial properties in England and Wales by one-fifth. It also increases the contributions payable by the Central Electricity Authority, and the nationalised gas industry, to the rate funds of local authorities in 1957-58 and subsequent years.

So far as the electrical trader or manufacturer is concerned the term "commercial property" covers shops, offices, warehouses and garages used for business purposes. It could presumably include such buildings as workers' clubs and canteens, provided such hereditaments are assessed by reference to current values and not to 1939 values. A building used partly as a dwelling and partly as business premises qualifies for a reduction of only one-seventh.

Industrial hereditaments are expressly excluded from the scope of the present Bill, which means, for the time being at any rate, that factories and "productive" enterprises will continue to be relieved of three-quarters of their present rates, a concession enjoyed since 1929. The Government has been carrying out a comprehensive review of local government finance for some time now and its conclusions are expected to be announced in the not-too-distant future. The omens are that some modifications will be made to the present de-rating provisions. Indeed, strong pressure in central and local government circles has been developing over a long period for the repeal of industrial de-rating and it may well be asked how long the Government can hold out against this growing weight of opinion. Among the influential bodies which have expressed themselves as being opposed to the continuance of industrial de-rating in its present form are the County Councils' Association and the Association of Municipal Corporations.

Strong Pressure for Repeal

Several attempts have been made in recent years to force the Government's hand in this direction. In February, 1955, Mr. G. A. Pargiter, Labour Member of Parliament for Southall, introduced a Private Member's Bill seeking to render industrial hereditaments liable to full rates instead of the present 25 per cent. More recently, in February, 1956, Mr. J. A. Sparks, Labour Member for Acton, introduced a measure with similar objects. Significantly, this was seconded by a Conservative member, Mr. Frederick Harris (N.W. Croydon). The Bill was defeated on its third reading by 179 votes to 134.

The loss of rates to local authorities as a result of the provisions of the new Rating and Valuation Bill must be recovered in one way or another and the Government has already intimated that this loss cannot be made up from Exchequer grants; therefore the most obvious remedy, apart from the re-rating of industry, will have to be an all-round increase in rates on other properties.

An example of how local authorities will be affected by this measure comes from Birmingham. There the chairman of the Rating and Valuation Committee recently announced that the plan to reduce rates on shops and offices would mean a loss of £500,000, the equivalent of a 9d rate; full rating of industry would bring the city an additional £3 million. This example, multiplied by the number of local authorities similarly affected, can be expected to reinforce the powerful pressure now developing for the repeal of de-rating.

Unless the Government proposes some entirely novel or radical departures from present rating practice, as a result of its current investigation into local government finance, it seems pretty evident that industry will be asked sooner or later to pay more rates. Whether this will amount to the full hundred per cent, or whether industry will be "let off" with any lesser proportion is by no means certain, although it seems doubtful whether the Government would reimpose the full amount in one single step, if only for psychological reasons.

Threefold Increase Possible

Should industry, however, be called upon to pay its full share of local rates it is estimated, at current valuations, that its share of rate payments would go up threefold, from £33 million to about £100 million a year. (This is based on the assumption that houses would continue to be assessed at their 1939 values and that agricultural land would still remain de-rated. How the present "de-rating" of shops and offices will affect this figure it is too early yet to say.)

Although the figure quoted—giving an increase in rate payments of nearly £70 million—may seem a large amount to collect from industry, the effect would not be so disastrous as might appear at first sight, since rates on business premises are deductible expenses against taxation. The result, from the point of view of local rating authorities, would be that the extra rate revenues would come to them direct and not through the Exchequer equalisation grants, a step to be welcomed if only because the dependence of local authorities on subventions from the Exchequer would be lessened. At the present time Exchequer grants to rate revenues collected direct by local authorities is in the proportion 52:48. Before the 1929 de-rating provisions the proportion was 24:76.

The present unhealthy dependence of the local town hall on large-scale financial support from Whitehall is not conducive to sound local government. After all, industry cannot remain indifferent to the services and the quality of administration provided by local councils any more than it can remain unaffected by the actions of the national Government.

* Mr. Hancock is a member of the Finance and Town Planning Committees of Ealing Borough Council.

Aluminium in Electrical Engineering

A SYMPOSIUM on "Aluminium in Electrical Engineering" has been arranged by the Aluminium Development Association, to be held on 16th and 17th May at the Institution of Electrical Engineers, Savoy Place, London, W.C.2. Twelve papers will be presented in the course of three sessions under the following headings:—"General and Economic Considerations in Using Aluminium in Electrical Engineering," "Aluminium in Transmission and Distribution Lines" and "Aluminium in Electrical Equipment." Applications to attend should be addressed to the Aluminium Development Association, 33, Grosvenor Street, London, W.1.

NEW BOOKS

Electrical Machines. By A. Draper. Pp. 168; figs. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2, price 17s 6d.

This work appearing in a new electrical engineering series is a textbook on the principles and theory of electrical machinery. It has a simple and direct approach which will be appreciated by the student even at intermediate standard and it goes far enough to cover his needs to graduate level.

The order of presentation is well planned; there are no references forward. The transformer is dealt with at length and is rightly the first " machine." This is immediately followed by chapters on windings and magnetic circuits. The induction and synchronous machines are then treated before consideration of d.c. machines. Thus, the latter take their proper place in perspective as being one particular type of many rotating machines, compared with so many other works where d.c. and a.c. machines are so severely segregated that students are apt to think that completely different phenomena occur in two distinct classes.

The torque-speed induction motor relationship is developed from the first principles of induced e.m.f. and the force on a current-carrying conductor in a magnetic field. This section also includes references to the induction generator, double-cage rotors and the induction regulator.

Three chapters are devoted to the alternator, dealing with generation, motoring and the parallel operation of such machines. Free and forced dynamical oscillations are considered, using a second order linear differential equation with constant coefficients.

The book is complete in itself and further chapters deal with induction alternators, synchronous convertors, commutation, polyphase commutator machines and the mercury arc rectifier. The modern outlook is maintained by including a section on magnetic amplifiers in the transformer portion and rotary amplifiers in the d.c. machines section. One sub-section of the latter deals with the basic principles of closed-loop automatic regulators.

It is a great pity, especially owing to the importance of automatic control aspects, that apart from the treatment of oscillations in alternators the dynamical aspects of machines are not considered, only static and steady state relationships being developed. Of minor importance, the author's introductory chapter is made unnecessarily difficult by his use of a double subscript notation for currents and voltages, a practice which is not subsequently used in the text.

The large number of examples included at the end, sectionalised into chapter contents, with answers, will be of great value to the student.—J.C.W.

The E.A.W. Electrical Handbook. Pp. 314; figs. 136. Edited for the Electrical Association for Women by the late Caroline Haslett, D.B.E. English Universities Press, Ltd., 102, Newgate Street, London, E.C.1. Price 15s.

The first edition of this very useful guide to domestic electrical installations and appliances appeared under the editorship of the late Dame Caroline Haslett in 1934 and it was subsequently re-published in 1936, 1939, 1945 and 1950. Now it has been completely revised and its value has been correspondingly increased.

Six chapters, all by D. J. Bolton, M.Sc., M.I.E.E., form a treatise on electricity and electrical circuits which, although it may be termed " technical," is written in such a way as to make the matter comprehensible by the layman —or, more correctly perhaps, laywoman. In the seventh chapter Dorothy M. Noakes, M.B.E., B.Sc., A.M.I.E.E., explains tariffs and methods of charging, and Elizabeth Truman deals with installations in Chapter 8.

In succeeding sections electric lamps and lighting (including lighting design) are covered by W. J. Jones, M.Sc., M.I.E.E.; " warming " and water heating by J. I. Bernard, B.Sc.Tech., M.I.E.E., M.I.H.V.E.; domestic cookers and the electric home laundry by Marjorie Pickford, B.Sc.; and motor-driven domestic appliances (including refrigerators) by Vera Norvick, M.R.I. The final chapter deals with electric shock, first aid treatment and artificial respiration (Holger-Nielsen method).

Generally speaking, all the information given has been brought up to date; one detects a small oversight in revision here and there but this does not affect the usefulness of the handbook.—J.H.C.

Electronics for Everyone. By Monroe Upton, edited by W. E. J. Farvis. Pp. 335; figs. Faber & Faber, Ltd., 24, Russell Square, London, W.C.1. Price 21s.

To-day almost everyone has a vested interest in electronics, as the owner of a radio or television set, and in this book the author has adopted an informal approach to the presentation of electricity and electronics, such that the average set owner may appreciate what happens and learn a little of how this is related to other modern developments.

About half the book is taken up by an extremely readable historical account of the pioneers of electricity, men such as Volta, Ohm, Faraday and Marconi; and this is the better half. One could wish that the author had been less biased electronically and could have produced a complete "potted" history of electricity and the electronic offshoot in terms of personalities, and in the easy style which he has used throughout.

Instead, the second half goes into the actual technicalities of radio and television design and touches briefly on many of the modern marvels of electronics, albeit with a slight American bias. Television is covered in a manner which makes clear the basic mysteries and includes a few hints on improving one's reception.

Most engineers will like the historical side of the book but will skip the remainder, while a wider public will doubtless readily absorb the whole work and find it interesting. There are plenty of illustrations, though many are of an unnecessarily childish type, and one feels that such reputable publishers should have resisted hand-written inscriptions on diagrams, often readable only with difficulty.—H.R.M.

BOOKS RECEIVED

Television Explained. 6th Edition. By W. E. Miller, M.A.(Cantab.), M.Brit.I.R.E. Revised by E. A. W. Spreadbury, M.Brit.I.R.E. Pp. 182; figs. Published for *Wireless and Electrical Trader* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 12s 6d.

Electrical Testing and Troubleshooting. By Philip T. Green. Pp. 191; figs. Industrial Press, New York. Bailey Bros. & Swinfen, Ltd., 46, St. Giles High Street, London, W.C.2. Price 34s.

The Art and Science of Protective Relaying. By C. R. Mason. Pp. 410; figs. John Wiley & Sons, Inc., New York. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 96s.

Canadian Power Expansion

Power development on the Bow River, near Calgary, Alberta [Photographic Surveys

Large Hydro-Electric Projects Nearing Completion

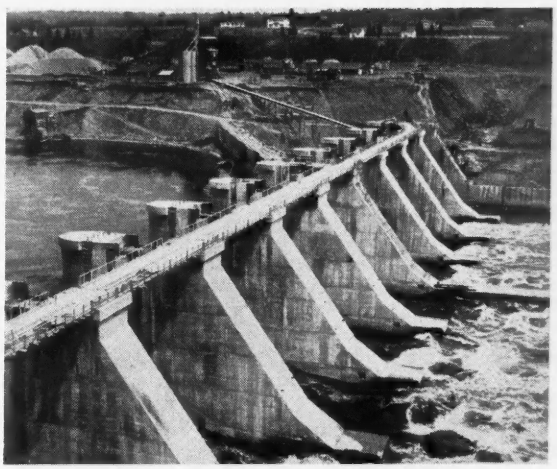
LAST year 845,000 h.p. of new capacity was added to the hydro-electric generating plant installations of Canadian public utilities, but this figure will be greatly exceeded in each of the next two years. In its annual survey the Water Resources Branch of the Department of Northern Affairs and National Resources says that construction has been very active on various projects and over 1,500,000 h.p. of new plant is expected to come into operation this year, with probably a further 2,500,000 h.p. next year. Even so, it has been found necessary to supplement water power developments by thermal schemes in order to meet the rising demand for power. One of the largest of these is the Richard L. Hearn generating station in Toronto, where a 200 MW Parsons turbo-generator is planned to come into operation next year. With two further units of the same rating, the capacity of the station is likely to be raised during the next five or six years to 1,000 MW.

Another important project of the Ontario Hydro-Electric Power Commission is a 20 MW experimental nuclear power plant. This is being constructed in collaboration with Atomic Energy of Canada, Ltd., and the Canadian General Electric Co., Ltd., near the Des Joachims (Ontario River) station and initial operation is scheduled for 1959. The output will be fed into the Commission's transmission network.

A number of gas turbine plants are being constructed in various provinces. One which will operate on either oil or natural gas, with four 30 MW units, is being built by the British Columbia Electric Co.

The largest addition to hydro-electric installations last year was in the province of Quebec (514,300 h.p.) where no less than 4,000,000 h.p. is likely to be added in the next five or six years. The two major developments being carried out by the Quebec Hydro-Electric Commission are those on the Bersimis River and at Beauharnois on the St. Lawrence River. At the Bersimis No. 1 station the underground power house will have a total installation of 1,200,000 h.p. in eight units and at the No. 2 station 23 miles downstream there will be a further 835,000 h.p. in five units. At Beauharnois the Commission has begun work on the third and final section of the power house which will contain eleven 65,000 h.p. units, making the total capacity of the whole development 2,150,000 h.p. In the same province the Aluminum Company of Canada is building a 1,000,000 h.p. plant at Chute des Passes on the Peribonka River, with initial operation scheduled for 1959.

The Ontario Commission hopes to complete the Sir Adam Beck-Niagara No. 2 station next year with an installed capacity of 1,680,000 h.p. Associated with this station, a pumped storage plant is being built half-a-mile



[New Brunswick Power Commission

Beachwood generating station, New Brunswick. This plant, due for completion late this year, will have a capacity of 135,000 h.p.

upstream and the first of the four 47,000 h.p. units is expected to come into operation early this year. On the Canadian section of the St. Lawrence project the first units are planned for service next year. The Commission's part of the power house will have an ultimate capacity of 1,200,000 h.p. in sixteen units. The labour force which the Commission employs on this project reached a peak of 4,500 last year.

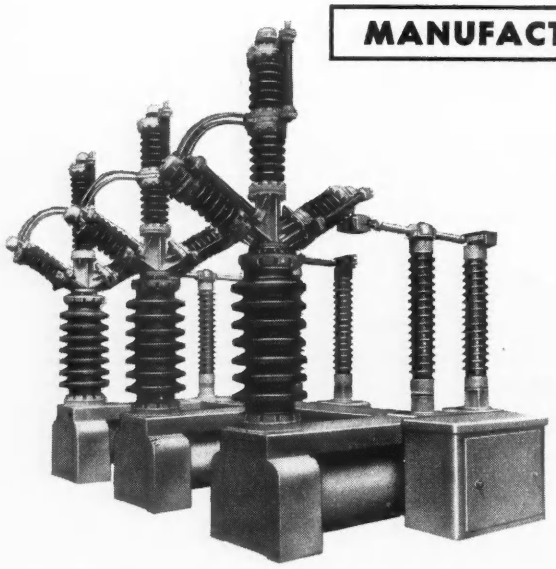
In British Columbia the Aluminum Company of Canada has installed a fourth 150,000 h.p. unit at its Kemano plant; the fifth is due to be brought into service next summer and the sixth next year, making the total capacity 900,000 h.p. The British Columbia Electric Co. has begun work on its Bridge River No. 2 development (four 80,000 h.p. units).

Large schemes in earlier stages include one with an ultimate overall development of nearly 5,000,000 h.p. envisaged by Northwest Power Industries, Ltd., in Yukon. In Labrador, investigations carried out by the British Newfoundland Corporation have proved the feasibility of developing a power site at Grand Falls, one of the largest untapped sources of hydro-electric power in the world.

Improvements in the technique of long-distance transmission are tending to make remoter sites available for economic exploitation. Notable among developments in this field last year was the completion of a double-circuit 300 kV line from Labrieville to Quebec and Montreal, a distance of 450 miles, and work has begun on three other 300 kV lines in the same province. In British Columbia a transmission line between the Bridge River plant and Vancouver will operate at 345 kV.

MANUFACTURING PROGRESS IN 1956

Ferguson, Pailin, Ltd.



Ferguson, Pailin 132 kV air-blast circuit-breaker

DURING 1956 Ferguson, Pailin, Ltd., achieved their highest ever turnover and the year was marked by steady expansion in sales of many products. Factory floor space was increased and the new four-storey office building was completed and now accommodates sales, engineering, research, contracts and designs drawing offices, and administrative staff.

Among the large home orders secured was the twelve-switch 132 kV, 3,500 MVA contract for the Central Electricity Authority's Harker switching station which will connect with the new Chapel Cross nuclear generating station and the Ministry of Supply rocket testing range at Spadeadam. An order was obtained for a second 132 kV duplicate busbar substation at Connah's Quay with nine circuits initially and provision for considerable extensions, some of which will control 300 MW of generating plant and 275/132 kV supergrid transformers.

A major achievement during 1956 was the installing and commissioning of the sixth 132 kV generator circuit at Carmarthen Bay power station six months ahead of schedule. The 275 kV, 7,500 MVA contracts included major extensions to the air-blast circuit-breaker installations at Uskmouth and Penwortham supergrid substations, while equipment was supplied in connection with 275 kV extensions at Castle Donington, Fleet, Staythorpe and High Marnham substations. Orders for metalclad gear included one for seventy-seven 6·6 kV, 350 MVA units for High Marnham power station. Another order was for 33 kV, 750 MVA metalclad gear at Salwick substation which will control the main supply to Springfields atomic factory.

The demand for low-voltage "K" and "KC" type gear continues and numerous orders are in hand for oil refineries, steel plants, cotton mills and other industrial undertakings in this country.

Despite increasing competition in overseas markets, contracts for all types of switchgear have been successfully negotiated, and orders for indoor cellular mounted breakers were received from the Rand and Orange Free State covering thirty-six 40 kV, 1,000 MVA circuit-breakers to supplement equipment already supplied by the company. Similarly, the city of Salisbury (Southern Rhodesia) further extended the 33 kV distribution system with twelve 750 MVA metalclad units with associated control equipment.

To meet increasing power commitments in Kuwait, ten 250, 350 and 500 MVA metalclad switchboards have been delivered and are in course of erection to extend the 11 kV distribution system. The many orders received from India included 22 kV, 750 MVA metalclad units for the Bombay Port Trust and twenty 11 kV, 150 MVA outdoor kiosks for the Bihar Government. The volume of 33 kV, 11 kV and lower-voltage switchgear orders from the Commonwealth and colonial territories has been maintained.

Electronics Convention

SOME thirty papers will be presented during the six sessions of the Convention of the British Institution of Radio Engineers which will be held in the University of Cambridge from 27th June to 1st July next. The theme will be "Electronics in Automation." Further information can be obtained from the Institution's offices, 9, Bedford Square, London, W.C.1.

VIEWS on the NEWS

By REFLECTOR

IN the House of Commons last week the President of the Board of Trade was asked whether he had received representations aimed at easing the restrictions on the hire-purchase of gas and electric cookers and water heaters. The President said that he had had such representations from a Gas Consultative Council but had no intention of relaxing the restrictions at present. This is one matter in which the gas and electricity supply industries see eye to eye and it draws attention once more to the indiscriminate nature of the restrictions. I am sure that whatever justification there may be for putting a curb on some forms of expenditure there is none for making it more difficult for people to obtain such essential appliances as cookers and water heaters.

* * *

Fears of harmful effects from radioactive products proceeding from nuclear power stations and research establishments are still very prevalent and form a principal argument against applications for permission to erect such stations or establishments. Objectors are assured at public inquiries into these applications that the risk of radioactive contamination is non-existent or negligible. I recently mentioned the statement at one inquiry that the effect on lobsters of effluent from the Atomic Energy Authority's proposed research centre in Dorset would be so small that a man could eat 2½ kg of them daily for seventy years with complete immunity. I hinted that this was an inordinate amount of lobster for anyone to consume. Last week at the Hunterston (Scotland) nuclear power station inquiry an Atomic Energy Authority witness put it in another way. He said that one could drink 2½ litres a day of the water discharged from the station for the rest of one's life without any ill effect. But what would be the outcome of a combination of the two practices?

* * *

Not everybody is apprehensive of possible harmful effects of nuclear power production. While at every public inquiry there are objectors to the erection of stations there are others who realise the benefits to be derived from them. There seems to be the greatest anxiety, for instance, among Welsh people to have an atomic power station. Mr. Gower asked the Paymaster-General (Mr. Maudling) a week or two ago if he could arrange for "the allocation to Wales of part of the enlarged atomic power programme." He was told that there had been no announcement of a revised programme yet, but that the siting of nuclear power stations was a matter for the Central Electricity Authority. The two deputy-chairmen of the C.E.A. were later tackled by Welsh M.P.s who made suggestions about possible sites in Wales.

* * *

Col. H. E. O'Brien, D.S.O., M.I.E.E., formerly electrical engineer to the L.M.S. Railway, who is now living in retirement in Ireland, has naturally been interested in British Railways' modernisation plan and the placing of contracts for further electrification and in a letter he recalls that it was as long ago as 1924 that he set out the advantages of full electrification in an I.E.E. paper. He detailed the advantages to be derived from electrical operation and worked out the comparative costs of steam and electric locomotives for various traffic densities. He showed that (in the conditions which then existed) with a traffic density of 2,000,000 trailing ton-miles per track mile there would be a loss of 1·26d per engine-mile with the use of electric locomotives, but for a density of 3,000,000 ton-miles the gain would be 2·54d per engine-mile rising to 7·39d for a density of 8,000,000 ton-miles. Col. O'Brien worked on the assumption that the traction system would be 1,500 V d.c., third rail, with overhead equipment at stations and station yards. It is noteworthy that his figures were based on coal at 23s a ton and electricity costing 0·4d per kWh at the h.v. busbars of the generating station, and 0·6d per kWh on the track. In 1955 coal cost British Railways about 74s a ton and in 1955-56 the C.E.A.'s revenue from traction supplies averaged 1·152d per kWh.

* * *

When the Hirakud Dam across the Mahanadi River in Eastern India was inaugurated recently by Mr. Nehru it was widely acclaimed as one of the triumphs of India's current five-year plan. It is salutary to have a reminder from Sir Ronald Wingate, in a letter to *The Times*, that the planning and beginning of the work dates back to the days before India secured independence. Sir Ronald says:—

> "The whole plan of harnessing the Mahanadi, both to diminish the yearly devastation caused by floods which made Orissa the poorest of the provinces of India, and to provide irrigation was made and put into action by us under the Empire, and the foundation stone of the dam was laid by Sir Hawthorn Lewis, the Governor of Orissa, on 15th March, 1946. At that ceremony he made a remarkable speech, giving the history of the project and paying tribute to the generous finance measures taken by the Government of India for a provincial subject, and to the genius of a famous Indian engineer, Mr. A. N. Khosla. He added that it would be for a successor of his to open the completed dam."

* * *

Thermo-electric piles have again been in the news lately; the advent of transistors has made them more feasible for supplying current to electronic devices. Seventy years ago some French equipment of this kind was used for comparatively heavy current applications. The *Electrical Review* of 11th February, 1887, described these Chaudron thermo-piles which were made up of as many as 400 elements weighing 200 grammes each. These were used in electroplating and the charging of accumulators, producing currents up to 7·5 A at 5·5 V. It was noted that "they are entirely free from the unwholesome and dangerous exhalations resulting from the employment of liquid batteries," but as they were gas-operated, with the fumes passing out of the top, this must have been a matter of opinion.

Letters to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Definitions of "Automation"

IN a paragraph in the *Electrical Review* of 4th January "Reflector" takes me to task for stating that, unlike mechanisation, automation involves the replacement of some mental work. "Surely," he replies, "this is a distinction without much difference, for all mechanisation involves the saving of some mental as well as physical effort."

"Reflector" would, no doubt, agree that an electric hand drill is a mechanised version of a hand drill of the wheel brace type. Perhaps he would explain how, in the operation of drilling an electric drill saves mental as well as physical effort.

In the same paragraph Lord Halsbury is quoted as saying that each topic grouped under "automation" has a technical name of its own which should be used. He implies that this should eliminate the need for the word "automation." Surely this is asserting that where we have names for the parts, we don't require a name for the whole.

London, N.W.1. E. G. SEMLER, B.Sc., A.M.I.Mech.E., Editor, *Automation Progress.*

The International Ohm

ALL the information concerning the international ohm conveyed in my letter of 4th January is accurate.

I would refer Mr. E. J. Beaven, who replied in the *Electrical Review* of 1st February to my earlier letter, to a book published by Prof. Fleeming Jenkin in 1873 on the "New Unit of Electrical Resistance," a copy of which can be seen in the British Museum, if it is not obtainable elsewhere. The history of the development of the standard ohm is fully and accurately covered by this book.

As a specific temperature is laid down for the column of mercury there would appear to be no point in relating it to any particular value of current.

Norbury, London, S.W.16. B. S. T. WALLACE.

Fluorescent Lamp Auxiliaries

WHEN the revised standard for tubular fluorescent lamps for general lighting purposes, B.S. 1853:1956, was published last year, it was decided that a new British Standard should be issued for accessories for fluorescent lamps operating on 50 c/s a.c. supplies. Parts 1 and 2 of this Standard, for ballasts and capacitors, are now ready and are published together as B.S. 2818:1957. The object of the new Standard is to give the characteristics of the auxiliaries which are essential for the proper operation of lamps complying with B.S. 1853 (Class MCF/U). It also deals with the satisfactory and safe operation of the auxiliaries themselves.

The present edition is limited to ballasts and capacitors required for the operation of 5ft 80 W mains-operated tubular fluorescent lamps used with starter operation on 50 c/s a.c. supplies. Requirements applicable to lamps of other sizes are to be included in a later edition.

Definitions are given in the "General" section of the Standard. Part I includes a section on the classification of ballasts; and sections on general requirements, tests and marking for ballasts and capacitors are given in Parts I and II respectively. Part III on "Starters" is in course of preparation.

Copies of the new Standard are available from the British Standards Institution, 2, Park Street, London, W.1, price 6s 6d.

I.E.E. Birmingham Dinner

OVER 400 members and their guests attended the annual dinner of the South Midland Centre of the Institution of Electrical Engineers in Birmingham last week. Mr. C. J. O. Garrard presided. Ald. J. R. Balmer, J.P., Deputy Lord Mayor of Birmingham, who proposed the toast of the Institution, said that in our efforts to train more scientific personnel in this country we must be careful not to have too much specialisation.

The response was made by Sir Gordon Radley, President of the I.E.E., who referred to the transatlantic telephone cable and said that this was only the beginning; already, engineers were considering whether something similar could be done on other world routes. After speaking of the success of Calder Hall and all it promised for the future, Sir Gordon said that this country depended on engineers. British scientists had given us a good start but engineers were needed to turn their results into products saleable in world markets.

After Mr. C. J. O. Garrard had proposed a toast to the guests and kindred associations, a brief reply was made by the Rev. R. G. Lunt, chief master, King Edward's School, Birmingham.

British Industries Fair

WE have received from the organisers a preliminary list of the exhibitors who will be taking part in the forthcoming British Industries Fair at Castle Bromwich, Birmingham, from 6th to 17th May. From the many concerns that will be arranging displays the following is a list of electrical firms together with those with allied electrical interests:—

Aiton & Co., Ltd.
Avery (W. & T.), Ltd.
Bakelite, Ltd.
Belliss & Morcom, Ltd.
Bendix Home Appliances, Ltd.
British Electrical Development Association
Bullows (Alfred) & Sons, Ltd.
Bulpitt & Sons, Ltd.
C.A.V., Ltd.
C.S.A. Industries, Ltd.
Dimplex, Ltd.
Donovan Electrical, Ltd.
Easiclene Porcelain-Enamel (1938), Ltd.
Electric Depot, Ltd.
Electrix, Ltd.
Electro Chemical Engineering Co., Ltd.
Electromagnets, Ltd.
Ellison (George), Ltd.
F.H.P. Motors, Ltd.
Felco Hoists, Ltd.
Fisher & Ludlow, Ltd.
G.W.B. Furnaces, Ltd.
Hadrill & Horstmann, Ltd.
Hawkins (L. G.) & Co., Ltd.
Heath (Samuel) & Sons, Ltd.
Herbert (Alfred), Ltd.
Higgs Motors, Ltd.
Holden & Hunt, Ltd.
Horvell Products, Ltd.
Imperial Chemical Industries, Ltd.
Keith Blackman, Ltd.
Liverpool Electric Cable Co., Ltd.
Lockers (Engineers), Ltd.
London Electric Wire Co. & Smiths, Ltd.
Lucas (Joseph), Ltd.
Magicook Appliances, Ltd.
Midland Fan Co., Ltd.
Osborn Manufacturing Co., Ltd.
Phœnix Sales, Ltd.
Pyrotenax, Ltd.
Ransomes Sims & Jefferies, Ltd.
Rapid Magnetic Machines, Ltd.
Rawlplug Co., Ltd.
Serck Radiators, Ltd.
Simplus Products, Ltd.
Smellie (James), Ltd.
Smith (Frederick) & Co.
Smith (S.) (Electrical Fittings), Ltd.
Southern Instruments, Ltd.
Spiral Tube & Components, Ltd.
Sterling Electric Holdings, Ltd.
Summerscales (W. & S.), Ltd.
Terry (Herbert) & Sons, Ltd.
Trumeter Co., Ltd.
Tufnol, Ltd.
United Ebonite & Lorival, Ltd.
Vactite Wire Co., Ltd.
Webb (H. C.) & Co., Ltd.
Westinghouse Brake & Signal Co., Ltd.

British Electrical Power Convention

AS has already been reported, the British Electrical Power Convention will this year be held at Eastbourne in the week commencing Monday, 17th June, under the presidency of Mr. J. Eccles, C.B.E., deputy chairman (operations), Central Electricity Authority (who received a knighthood in the New Year Honours). This year the theme of the Convention is "Electricity in the National Economy" and the papers will cover a broad field in British electrical development.

The Convention will begin with the presidential address on Tuesday, 18th June, and in the afternoon papers will be presented on behalf of the British Electrical and Allied Manufacturers' Association, the Water-Tube Boilermakers' Association, and the electricity supply authorities, dealing with the progress made in the manufacture of power plant and the construction of generating stations of the more conventional types.

Wednesday morning will be devoted to papers on transmission and distribution from the B.E.A.M.A., and the supply authorities. In the afternoon, a paper on the development of nuclear power will be presented. The authors of this paper will show, in a not too technical way, the rapid progress which has been made in this country and will indicate some of the future possibilities.

On Thursday morning, 20th June, there will be three papers—by the supply authorities, the consulting electrical engineers, and the electrical contractors. These will deal with utilisation and will indicate the economies that can be achieved in factory, shop, and warehouse by the proper use of electricity.

The social value of electricity is to be the subject of a paper on Thursday afternoon presented by the B.E.A.M.A., the British Electrical Development Association, and the Electrical Association for Women. These papers, with demonstrations by Mr. W. J. Jones, M.Sc., M.I.E.E., will illustrate the progress which has been made to enable a better and more economical use of electricity in the home.

The titles of the various papers are not final but are indicative of the subjects which will be dealt with. Except where otherwise stated, all meetings will be held at the Winter Garden.

CONVENTION PROGRAMME

MONDAY, 17th JUNE

9 p.m. Official opening of the Electrical Exhibition.

TUESDAY, 18th JUNE

First Session.—10 a.m. Opening of Convention; 11.30 a.m., official visit by the President to the Exhibition.

Second Session.—2.45 p.m. 1. "*Coal and oil-fired Generating Stations*," by F. H. S. Brown, B.Sc.(Hons.), M.I.Mech.E., M.I.E.E. (chief engineer, C.E.A.) and E. S. Booth, M.Eng., M.I.Mech.E., M.I.E.E. (deputy chief engineer, design and construction, C.E.A.). 2. "*The Contribution of the Boilermaking Industry to the Economic Development of Electrical Power Generation*," by W. F. Simonson, B.Sc.(Eng.), A.C.G.I., M.I.Mech.E. (technical officer, Water-Tube Boilermakers' Association) (presented on behalf of the W.T.B.A.). 3. "*The Contribution of the Turbo-Alternator Manufacturers to Technical Advancement and to the National Economy*," by L. S. Robson, M.C., M.Sc.(Tech.), M.I.Mech.E. (chief engineer, Steam Turbine Department, Metropolitan-Vickers Electrical Co. Ltd.) (presented on behalf of the B.E.A.M.A.).

3.30 p.m. Ladies' Tea—Pier Ballroom.

8.0 p.m. Reception by the Mayor of Eastbourne.

WEDNESDAY, 19th JUNE

Third Session.—9.30 a.m. 4. "*The Economic Aspects of High-Voltage Transmission*," by F. J. Lane, O.B.E., M.Sc., M.I.E.E. (deputy chief engineer, transmission, C.E.A.) and P. J. Squire, B.Sc., D.F.H., M.I.E.E. (system operation engineer, C.E.A.). 5. "*Transmission Switchgear for 132 kV and Higher Voltages*," by C. H. Flurscheim, B.A., M.I.E.E., M.Amer.I.E.E. (chief electrical engineer, Metropolitan-Vickers Electrical Co., Ltd.). 6. "*Developments in Transformers for 132 kV and Higher Voltages*," by E. C. Rippon, M.I.E.E. (chief transformer engineer, C. A. Parsons & Co., Ltd.). 7. "*The Post-War Development of the Distribution of Electricity*," by G. F. Peirson, M.I.E.E., M.Amer.I.E.E. (chief engineer, Midlands Electricity Board) and J. Henderson, M.C., B.Sc., A.R.T.C., M.I.E.E. (chief engineer, South of Scotland Electricity Board). 8. "*Power Station and Distribution Switchgear*," by J. S. Cliff, M.I.E.E. (manager, Switchgear Works, General Electric Co., Ltd.). 9. "*Distribution Transformers*," by S. Z. de Ferranti (Ferranti, Ltd.) (papers 5, 6, 8 and 9 presented on behalf of B.E.A.M.A.).

Fourth Session.—2.45 p.m. 10. "*Nuclear Energy in Great Britain*," by J. C. Duckworth, B.A. (deputy chief engineer, nuclear power, C.E.A.) and W. H. C. Pilling, B.A., M.I.E.E. (project engineer, C.E.A.).

THURSDAY, 20th JUNE

Fifth Session.—9.30 a.m. 11. "*Electricity Supplies to Industry*," by C. T. Melling, C.B.E., M.Sc.(Tech.), M.I.E.E., M.I.Mech.E. (chairman, Eastern Electricity Board). 12. "*The Selection, Installation and Maintenance of Electrical Plant in Factories*," by Sir Henry Clay, Bt., M.A., M.I.E.E. (Partner, McLellan & Partners) and G. Ovens, B.Sc., M.I.E.E. (technical director, McLellan & Partners) (presented on behalf of the Association of Consulting Engineers). 13. "*Industrial and Commercial Electrical Installations—Their Contribution towards Economy and Efficiency*," by H. S. Wathes (director, T. H. Wathes & Co., Ltd., Leicester, and vice-president, Electrical Contractors' Association).

Sixth Session.—2.45 p.m. 14. "*The Economics of a Well-Wired Home*," by E. J. Davies (chairman, B.E.A.M.A. Accessories Section) (on behalf of the B.E.A.M.A.). 15. "*Utilisation of the Electricity Services*," by V. W. Dale, Companion, I.E.E. (on behalf of E.D.A.). 16. "*The Practical Housewife's Point of View*," by Miss Mary George, M.B.E. (on behalf of the E.A.W.). 17. Lighting and Wiring Demonstrations, by W. J. Jones, M.Sc., M.I.E.E.

7.30 p.m. Annual Dinner—Grand Hotel; dance at the Winter Garden afterwards.

FRIDAY, 21st JUNE

Seventh Session.—10.0 a.m. Electrical Forum. 12 noon. Annual General Meeting.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. J. G. Christopher, T.D., F.I.E.S., who has become chairman of the new Electric Lamp Industry Council, the formation of which we reported in our last issue, is general sales manager of the Atlas Lighting Division of Thorn Electrical Industries, Ltd. Mr. Christopher began his career with the General Electric Co., Ltd., in 1925 and trained as an illuminating engineer. In 1931 he was lent to the London Underground Railways for 2½ years and undertook responsibility for the lighting of the Cockfosters extension and rebuilt stations in the Central London area. During the war he served as a signals officer and he joined the Territorial Army in 1949 to command a London T.A. Signals

Mr. J. G. Christopher

Mr. E. J. Counter

Regiment and was promoted colonel in 1953. From 1947 to 1954 he was assistant sales manager of the Osram Lamp Department of the G.E.C.

The secretary of the new Council is **Mr. E. J. Counter,** M.C. Mr. Counter was educated at Maylan Preparatory and Dartford Grammar Schools and entered the services of a London bank before the war. During the war he served in the Royal Artillery and was demobilised with the rank of major. After a short period with the War Office he joined the staff of the Electric Lamp Manufacturers' Association in 1946 and in 1954 he was appointed commercial officer with E.L.M.A.

Four new appointments are announced by Mr. H. C. Timewell, manager of the English Electric Co.'s Appliance and Television Division. **Mr. A. W. H. Bradstreet** has been appointed assistant sales manager for the United Kingdom, responsible to Mr. A. Mackenzie Parkinson. Mr. Bradstreet has been area manager for London and South England. In his new capacity he takes over the office formerly occupied by **Mr. V. Coffee,** who has resigned to take up an appointment with another company. **Mr. J. C. Andrews,** who has been the division's sales training officer since 1953, is appointed southern area manager, and will be based at Tonbridge. **Mr. T. Machell** has transferred from area manager in South East England to London area manager. **Mr. D. N. Ward** has been appointed sales representative in the North West.

Mr. E. F. Croft has been appointed London branch engineer of the Reliance Telephone Co., Ltd. Mr. Croft joined the company in 1928 and in his new appointment he will be responsible for the whole of the installation and maintenance work in the South East of England.

Mr. D. H. Walker, district commercial engineer of the Yarmouth District of the Eastern Electricity Board, has been appointed to a similar position with the Board in the South West Essex District.

Mr. F. W. Cooper, B.Sc.(Eng.), M.I.Mech.E., M.I.Prod.E., principal of the Chance Technical College, Smethwick, has been appointed education and technical officer to the Institution of Production Engineers. He will take up his appointment in London on 1st April.

At a recent Council meeting of the Incorporated Advertising Managers' Association the following were elected Fellows of the Association: **Messrs. W. S. Boone** (Johnson & Phillips, Ltd.), **A. G. Coaten** (British Tabulating Machine Co., Ltd.), **H. H. Lusty** (Metropolitan-Vickers Electrical Co., Ltd.), **F. R. Smith** (Davy & United Engineering Co., Ltd.) and **J. H. White** (Bendix Home Appliances, Ltd.).

Mr. H. T. Shepherd has been released by the board of A. C. Cossor, Ltd., from his present appointment as financial comptroller to become managing director of Best Products, Ltd., a Cossor subsidiary with factories at Felixstowe, manufacturing a range of domestic electrical ware.

Mr. J. C. Robertson, A.M.I.E.E., D.F.H., has been appointed manager of the London branch of Johnson & Phillips, Ltd. Mr. Robertson received his technical training at Faraday House and served his apprenticeship with the Parsons Engineering Co., Ltd., and Metropolitan - Vickers Electrical Co., Ltd. After war service in the Electrical Branch of the R.N.V.R. he joined the London Power Co., Ltd., as protective gear engineer and later was with the Plessey Co., Ltd., as assistant to the manager of the equipment division and then joint manager of the Coil and Transformer Department. Mr. Robertson joined J. & P. in 1953 as a senior sales engineer and was made assistant manager of the London branch in 1955.

Mr. J. C. Robertson

Mr. G. C. Smith, B.Eng.(Hons.), A.M.I.E.E., has been appointed an assistant chief commercial officer (tariffs and economics) by the Eastern Electricity Board in place of **Mr. W. D. Kennedy** who recently resigned to take up an appointment in Canada. Mr. Smith, who was born in Wakefield and educated at St. Peter's School, York, and at Sheffield University, spent the first two years of his professional career with the Electrical Research Association at Perivale and during the war was employed by the Admiralty on the work of combating the magnetic mine. He saw service in the Far East and, upon his release from the Admiralty, joined the Edmundsons group of companies. Following a mains engineering appointment in Somerset and a period as technical and meter engineer in Cornwall, Mr. Smith joined the Eastern Electricity Board in 1948 as an assistant commercial engineer, engaged on tariffs and economics.

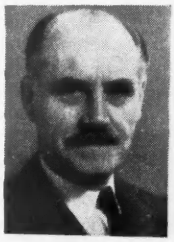
Mr. G. C. Smith

Mr. A. D. Hardaker has been appointed manager of D.R. Illuminations, Ltd., the recently formed subsidiary of Nettle Accessories, Ltd., reference to which is made in our "Industrial News" section in this issue. Mr. Hardaker served an apprenticeship with Ferranti, Ltd., and was subsequently with Chamberlain & Hookham, Ltd., and the Metropolitan-Vickers Electrical Co., Ltd. He joined Nettle Accessories, Ltd., in 1955.

Mr. R. H. Shimwell, a specialist in the design of rotating electrical machines, has been appointed engineer-in-charge of the electrical division of Simms Motor Units, Ltd. Mr. R. H. Shimwell began his career in engineering at the Faraday House Electrical Engineering College, and was then apprenticed to the Metropolitan-Vickers Electrical Co., Ltd., at its Manchester and Sheffield works. His subsequent experience included appointments with Westinghouse Brake & Signal Co. and C.A.V., Ltd.

Mr. R. W. C. Reeves

Mr. J. S. A. Bunting


Mr. H. E. Helwig

Mr. H. B. Davies

Mr. W. E. Hind

Mr. R. W. C. Reeves, M.I.E.E., a director of Johnson & Phillips, Ltd., has been re-elected chairman of the Cable Makers' Association for a second year, and **Mr. J. S. A. Bunting,** M.C., Associate I.E.E., a director of Siemens-Ediswan, Ltd., has been re-elected vice-chairman of the Association, also for a second year. **Mr. H. E. Helwig,** of Siemens Brothers & Co., Ltd., has been appointed chairman of the Overseas Rubber Cable Makers' Association, **Mr. H. B. Davies,** of Enfield Cables, Ltd., has been appointed chairman of the Mains Cable Manufacturers' Association and Mains Cable Manufacturers' Association (Super Tension), and **Mr. W. E. Hind,** of British Insulated Callender's Cables, Ltd., has been elected chairman of the Rubber and Thermoplastic Cable Manufacturers' Association.

Mr. J. F. Levy, who writes in this issue (p. 229) on the use of an analogue computer in the design of electric motors, was educated at the University of Cape Town from which he graduated in 1949 with a B.Sc. in electrical engineering. Mr. Levy then became junior lecturer at the University for a time until joining the British Thomson-Houston Co., Ltd., at Rugby, in 1951 as a graduate apprentice. Since 1953 he has been in the Motor Engineering Department.

Mr. J. F. Levy

Mr. A. F. Meylan, resident engineer at the Leeds branch of Lewis's, Ltd., since the opening of the store in 1932, and formerly supervising electrical engineer at the Manchester and Liverpool branches, has been presented with a dining table on his retirement after thirty-five years' association with the company. Mr. Meylan was chairman of the Leeds branch of the Association of Supervising Electrical Engineers for two years from 1938.

Mr. Harry Foster-Smith, M.C., M.I.E.E., of Birmingham, has been appointed by the United Nations Technical Assistance Administration to instruct trainees in the erection, operation and maintenance of power plant and transmission lines at the University of Roorkee, India. The appointment, which has been made at the request of the Government of India, is part of the programme of the United Nations and the Specialised Agencies to assist less-developed countries to utilise fully natural resources, solve development problems and to raise living standards. The appointment is for a period of one year initially.

Before his new appointment, Mr. Foster-Smith served for twelve months as a United Nations adviser on the manufacture and maintenance of electrical plants in Venezuela. Earlier, he served with the British Electricity Authority as senior assistant engineer to the chief engineer, as Birmingham regional officer in charge of production, inspection and testing of electrical and mechanical plant manufacture in the Midland area and South Wales and assistant general manager of a gold mining company in Colombia.

Mr. E. H. S. Bullen, the present London manager of Pirelli-General Cable Works, Ltd., is to retire on 31st March next owing to ill-health. **Mr. I. McWhirter,** who until recently was district sales engineer for North West England, has been appointed as the new London manager. Mr. Bullen will be retained in a consultative capacity. **Mr. B. Campbell Smith,** formerly with the Manchester Branch of the General Electric Co., Ltd., has been appointed to succeed Mr. McWhirter in North West England. **Mr. G. Eastland** has been appointed assistant to Mr. R. Bunch in the Midlands area and will operate from Birmingham.

Following the death of Mr. Elijah Hepworth, chairman and managing director of Hepworth & Grandage, Ltd., the following appointments have been made in the Hepworth & Grandage group of companies :— Hepworth & Grandage, Ltd.: **Messrs. J. L. Hepworth** and **G. C. Hepworth** (joint managing directors); **Mr. J. H. Mallinson** (sales director). Hepworth & Grandage (Yeadon), Ltd.: **Mr. G. C. Hepworth** (managing director), **Mr. J. L. Hepworth** (director) and **Mr. A. T. Beacham** (director and secretary). Leeds Piston Ring & Engineering Co., Ltd.: **Mr. H. Forrest** (managing director) and **Mr. A. T. Beacham** (director and secretary).

Mr. J. L. Hepworth

Mr. G. C. Hepworth

Mr. J. H. Mallinson

Mr. S. H. Chase, M.I.E.E., manager, stationary battery sales, Chloride Batteries, Ltd., has retired and he is succeeded in that position by **Mr. D. S. Howarth,** Graduate I.E.E.

Mr. Chase joined the company in 1923, having served an apprenticeship with Clayton & Shuttleworth, Lincoln, and studied at Finsbury Technical College. Throughout his career he has been connected with stationary battery sales for the company and in 1950 became assistant manager, stationary battery sales, assuming full responsibility in 1956.

Mr. Howarth was educated at Farnworth Grammar School and the Polytechnic, Regent Street, London, joining Chloride Batteries, Ltd., just before the last war. After war service he returned to the company in 1947 and was appointed sales engineer for the London area. He has now moved to the Exide Works at Manchester to take up his new appointment.

Mr. L. Hewitt has been appointed London area manager (sales), and **Mr. H. Hollingworth** Midland area manager (sales), of the Metals Division of McKechnie Brothers, Ltd., Birmingham.

Mr. W. R. R. Husser has been appointed sales manager of J. & H. McLaren, Ltd., Leeds. He was previously a field director with the Brush Group export organisation.

The **ex-Johnson & Phillips Association** is holding its annual reunion dinner on 2nd March, at Grosvenor House, Park Lane, W.1. Past members

of the J. & P. staff, who are not members of the Association and would like to attend the dinner, are invited to write for particulars to Mr. S. W. Foakes, hon. secretary, ex-J. & P. Association, 22, Madison Gardens, Bexleyheath, Kent.

Mr. Michael Parkinson, M.A., has been appointed to the board of Crompton Parkinson, Ltd. Mr. Parkinson joined the company in 1950 as a trainee in the Production and Engineering Departments. In 1951 he was a member of the Crompton Parkinson productivity team which visited the United States and, at the conclusion of the tour, he remained for a period of further special experience in the United States and Canada. He has further extended his knowledge of the company's overseas interests with visits to Australia and South Africa. After serving on the junior board from 1952, he was co-opted to the board of executive directors in 1953, and was appointed general manager of the company's Guiseley Works in 1954. In April last year he joined the board of executive directors and was appointed an assistant managing director. He will retain that appointment and the general managership of Guiseley works.

Mr. M. Parkinson

Mr. Ian MacLeod-Smith has been appointed field director for the Brush Group export organisation for the Caribbean area. He was previously sales manager of J. & H. McLaren, Ltd., a member company of the Brush group.

Mr. T. H. Exelby has been appointed generation engineer with the Sudan Light & Power Co., Ltd., Khartoum, and will be in charge of the Burri power station. Mr. Exelby served his apprenticeship with Vickers, Ltd., following which he was for six years with the Orient Steam Navigation Co., Ltd. His first shore position was with the Nitrogen Fertilizer Co., Ltd., as charge engineer at its Flixborough, Scunthorpe, power station. This was followed by the appointment of power plant engineer with the General Electric Co., Ltd., at Birmingham. In 1946 Mr. Exelby became boiler house engineer with the Preston Corporation at the Ribble generating stations, and continued there after nationalisation. He has held the successive positions of assistant charge engineer, charge engineer and, during the past three years, deputy station superintendent.

Mr. T. H. Exelby

Morphy-Richards, Ltd., announce that, in accordance with the statement made in his annual report to the stockholders in October last, **Mr. H. D. Drysdale** has resigned from the chairmanship of the company; he remains a director. **Mr. F. P. Bishop,** M.B.E., M.P., who has been a director of the company since February, 1955, has been elected chairman. **Mr. D. L. T. Oppe,** a managing director of Robert Benson, Lonsdale & Co., Ltd., has been appointed a director. **Mr. J. R. Ingoldby** has given up his seat on the board as his whole time and attention is now engaged by the secretarial and accountancy work of the Morphy-Richards group of companies.

Domestic heating of the future was referred to by Mr. A. N. Irens, chairman of the South Western Electricity Board, at the annual dinner of the Bristol Branch of the **Electrical Contractors' Association** held on 1st February at the Royal Hotel, Bristol. Mr. Irens, in proposing the toast of the Association, said that he believed that some of us would see the time when all new houses were heated electrically by elements embedded in the structure of the building, using electricity generated by base-load nuclear power stations during off-peak periods. Electrical contractors were playing a very full part in helping to develop the use of off-peak storage space heating. In the West country more than 200,000 new consumers had been connected to the mains in eight years. Mr. A. Dumenil, chairman of the Branch, who presided, replied to the toast.

In reporting the recent presentations to long-service employees of the **Brush Electrical Engineering Co., Ltd.,** in our issue of 25th January, we regret that the name of Mr. M. Tattersfield, the managing director, was incorrectly given as Mr. Pattersfield.

OBITUARY

Mrs. L. H. A. Carr.—We regret to learn from Mr. L. H. A. Carr, M.Sc., M.I.E.E., that his wife, Norah, died on 29th January after a brief illness. Mrs. Carr took a prominent part in the Electrical Association for Women in the north-west and had been chairman of the Manchester and District Branch and of the North Western Area. Mr. Carr was for many years with the Metropolitan-Vickers Electrical Co., Ltd.; he retired in 1955 and now lives at Christchurch, Hants.

Mr. J. L. Lovell, liaison officer with the Admiralty and Government Departments in the West of England for William McGeoch & Co., Ltd., died on 23rd January, at the age of seventy-four. Mr. Lovell went to Bristol after the 1914-18 war as manager of the local branch of the Metropolitan-Vickers Electrical Co., Ltd. Later he joined the staff of the Admiralty at Bath and since the last war had acted as local agent for various electrical manufacturers.

Mr. Sidney Taylor, M.B.E., M.I.Mech.E., co-director with Mr. K. J. Mawson, of Mawson Taylor, Ltd., died recently. Mr. Taylor was also chairman of the General Engineering Co. (Radcliffe), Ltd.

Mr. Henry Neville Rodgers, who retired from the position of power station superintendent at Rotherham in 1941, died on 25th January at the age of seventy-seven.

CATHODIC PROTECTION

An order has recently been received by Metal & Pipeline Endurance, Ltd., for impressed current cathodic protection of the ballast compartments of an ore carrier from Swan Hunter, Wigham Richardson, Ltd. It is believed that the scheme will be the first of its kind in the world, offering many advantages over the more conventional magnesium anode type of installation. The installed cost is very little more than that of a magnesium anode scheme although the life is said to be at least five times greater.

Briefly, the plant consists of a steam driven alternator supplying transformer rectifiers mounted at convenient points adjacent to the tanks. Silicon iron anodes are installed in the ballast compartments and are connected through electrical wiring and control gear to the transformer rectifiers. Control of the current is effected at the transformer rectifiers and a more flexible operation is thus possible than with magnesium anode protection, so that a heavier calcareous film can be deposited to protect the tanks from atmospheric corrosion after de-ballasting.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUMi ngots	ton £197 0s 0d
COPPER, H.C. Electro	ton £250 10s 0d
Fire Refined 99·7%	ton £249 0s 0d
Fire Refined 99·50%	ton £248 0s 0d
COPPER Tubes ..	lb 2s 5½d
Sheet	ton —
H.C. wire and strip ..	ton £301 15s 0d
LEAD, English ..	ton £114 10s 0d
Foreign	ton £113 0s 0d
MERCURY	flask £85 15s 0d
TIN, block (English) ..	ton £795 0s 0d
ZINC, G.O.B. Foreign	ton £103 5s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 2s 0½d
Sheet	ton —
Wire	lb 2s 9½d
PHOSPHOR BRONZE Wire	lb 4s 1½d
PLATINUM	oz £34 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 26d—26½d

PARLIAMENTARY REPORT

Siting of Nuclear Power Stations

Lord Mills of Studley, the new Minister of Power, was congratulated by Lord Lawson on his appointment when the Minister made his first statement in the House of Lords last week. He was replying to a question by Lord Lawson who wanted to know who decided the location of works established for atomic power production.

Lord Mills said it was a great pleasure for him, on the first occasion that he addressed the House, to answer a question on a subject in which Britain led the world—the development of atomic power for peaceful purposes. In the case of power stations for the public electricity supply, the selection of sites in England and Wales was a matter for the Central Electricity Authority. The criteria adopted were well described in the Authority's eighth annual report, the most important being really large and readily available supplies of water for cooling purposes and ground formation capable of bearing the extremely heavy reactors. Before proceeding with the construction of the station the C.E.A. required his consent under Section 2 of the Electric Lighting Act, 1909, and planning permission under the Town and Country Planning Act, 1947.

Lord Lawson said that a Commission considered this matter for some years before the last war, and practically every one of their decisions had been ignored in the establishment of these new stations.

Lord Lucas of Chilworth spoke of the widespread disquiet about the siting of nuclear stations and the action of the C.E.A. in "their present murdering of the countryside."

Viscount Alexander of Hillsborough, who said he lived five miles from the site of the proposed Bradwell station, complained of the inadequacy of the consideration given to the people who raised objections to the station, and the imperfect machinery for having a really judicial inquiry. The person in the chair was not really qualified in juridical procedure—he was an engineer—and the Bradwell objectors did not feel that their case was ever adequately considered.

Lord Mills said many more atomic power stations were to be built and he was impressed by the importance of preserving as far as possible the amenities of the countryside in developing those plans. The matters which had been raised would have his careful consideration.

Cost of Scottish Schemes

Lord Lucas asked what was the average capital cost per kW installed by the North of Scotland Hydro-Electric Board for all existing and future schemes, including development of catchment areas and for various other details.

Lord Strathclyde, the Minister of State, Scottish Office, in a written reply, stated that the average capital cost per kW installed for all hydro-electric schemes already constructed, under construction, or sanctioned but not yet started (total capacity 835,000 kW) was estimated at £175. The capital costs per kW installed for the individual schemes were:—

Scheme	£ per kW
Sloy	71
Tummel-Garry	122
Fannich	146
Mullardoch-Fasnakyle-Affric	150
Shira	183
Gaur	172
Glascarnoch-Luichart, Torrachilty	298
Lawers	193
Moriston	209
Garry	228
Breadalbane	224
Orrin	264
Tummel Valley additions	113
Shin	207
Morar	227
Lochalsh	215
Gairloch	294
Cowal (Argyll)	356
Lussa (Kintyre)	533
Storr Lochs (Skye)	253
Loch Dubh (Ullapool)	366
Mucomir (Inverness-shire)	243
Allt-na-lairige (Argyll)	242
Gisla (Lewis)	350
Loch Chliostair (Harris)	386
Kilmelfort (Argyll)	334
Loch Glashan (Argyll)	239

The last 13 schemes, with individual capacities of 6,000 kW or less, totalling 35,000 kW are principally for the supply of local needs.

Work has not yet started on the Mucomir, Gisla, Loch Chliostair and Loch Glashan schemes, the cost of which has been estimated on the basis of current prices.

The capital cost of distributing power from all the Board's power stations (hydro-electric, steam and diesel) up to the end of 1956 was £56 per kW. For 1956 the average cost of hydro-electric generation was 0·64d/kWh and of all generation, including steam and diesel, 0·75d/kWh. In the same year the average cost of electricity delivered to consumers was 1·62d/kWh.

Customs Duties Bill

In the committee stage debate on the Customs Duties (Dumping and Subsidies) Bill, Sir David Eccles, President of the Board of Trade, said that the Government accepted the principle of an amendment which stated that the Board of Trade would not exercise its powers under the Bill unless it appeared that the dumping or subsidising of the imports concerned would cause or threaten material injury to an industry in the United Kingdom.

On an amendment moved by Mr. Cronin, Mr. Nabarro added a plea that the Bill should be altered to allow anti-dumping duties to be imposed when in the foreign country raw material subsidies and favourable taxation treatment were given to manufacturers. In Britain, for example, manufacturers had always laboured under the disadvantage that the Inland Revenue depreciation allowances were applicable to the historical cost of the plant. The Belgians, on the other hand, deliberately allowed manufacturers to double the value of plant standing on their books to take account of inflation during the war years.

Sir D. Eccles said that it was intended to interpret "subsidy" as covering all the methods of assistance which had been mentioned by Mr. Cronin and Mr. Nabarro, but he would see whether it would be worth while to enlarge on the definition in the Bill.

Grants for Farm Improvements

In a statement about the new Government grants of one-third of the cost of capital improvements on farms, Mr. Amory, Minister of Agriculture, said that they would apply to, among other things, the execution of works in connection with the supply of electricity to farms.

Exports to China

In reply to Viscount Elibank, who again asked for a revision of the China embargo list to remove from it all goods not embargoed for the U.S.S.R., the Earl of Gosford, Under-Secretary for Foreign Affairs, said that United Kingdom exports to China in 1956 were £2,900,000 more than in 1955. The Government had taken the initiative in obtaining a revision of the embargo list but complete agreement from all in the Consultative Group was needed before anything further could be done.

Heat Insulation of Factories

Mr. Gerald Nabarro, Conservative member for Kidderminster, whose Private Member's Bill dealing with air pollution led to the Government-sponsored Clean Air Act, obtained leave to introduce another private Bill last week. This one, which is also aimed at fuel conservation, is called the Thermal Insulation (Industrial Buildings) Bill.

He said that in view of the current and prospective fuel and power situation it was of supreme importance that fuel and power should be employed with the utmost efficiency. This Bill was concerned with the retention of heat in industrial buildings—heat that had been generated as the result of raising steam for productive, processing and heating purposes within the building. Between 1951 and 1956 we erected 215 million sq ft of new industrial buildings yet only about 10 per cent were thermally insulated. In 90 per cent of the buildings we dissipated valuable supplies of fuel

and power, amounting to between 25 and 50 per cent of the fuel consumed for heating. The National Industrial Fuel Efficiency Service had stated that up to 6 million tons of coal or coal equivalent were lost each year from the failure to insulate thermally our industrial buildings. Taking the output of a miner as 300 tons a year, this represented the productive effort of 20,000 miners a year.

The Bill was read the first time; its second reading is fixed for 15th March.

Duties of Paymaster-General

Mr. Arthur Palmer asked the Prime Minister what were the duties of the Paymaster-General in relation to the Ministry of Power.

Mr. Macmillan replied that the Paymaster-General's main duty was to be the representative in the House of Commons of the Minister of Power in all his responsibilities. He had undertaken this important duty without regard to rank.

Minister of Power's Responsibilities

Asked by Mr. Jay about the departmental responsibilities of the new Minister of Power, the Prime Minister, Mr. Harold Macmillan, said that Lord Mills would be responsible for the nuclear power programme, but the Atomic Energy Authority would remain the responsibility of the Lord President of the Council.

Mr. Jay: "Is it not clear that the Minister of Power has no authority over the Atomic Energy Authority and that the Ministry of Power is little more than the old Ministry of Fuel and Power without the word 'Fuel'?"

Mr. Macmillan replied that the official responsibility given to the Minister included the general oversight of the iron and steel trade, which was quite a big item. Research which was done by the Atomic Energy Authority was under the Lord President of the Council, but when it came to the practical development and implementation it was the work of the Minister of Power.

Atomic Power in Ships

In reply to a question by Major Wall, Mr. T. G. D. Galbraith, Parliamentary Secretary to the Admiralty, said that scientists and naval officers serving at the Atomic Energy Establishment at Harwell had for some years been collecting the knowledge necessary for the application of nuclear power to marine propulsion. Detailed work on the design of a prototype submarine nuclear powered installation, which was shore based, was now well advanced and some orders for the prototype machinery had been placed. It was planned to construct a basically similar plant for installation and extensive trials in a sea-going submarine. Experimental work on shielding problems was also proceeding at Harwell. The wider question of further application of nuclear power to ships for both the Royal and Merchant Navies was being carefully studied, and encouraging progress had been made with feasibility studies.

In reply to Mr. Hector Hughes, the Paymaster-General (Mr. Maudling) said that investigation of nuclear propulsion of ships was still in too early a stage for the gap in costs to be estimated, but the main purpose of the work that was being done was to find a method which would make the nuclear propulsion of ships commercially attractive.

Employment at E.M.I. Factories

Mr. Hunter asked the Minister of Labour how many employees at the E.M.I. factories at Feltham and Hayes were estimated shortly to become redundant and what steps were being taken to find them alternative employment.

Mr. Iain Macleod said that so far as he was aware no major redundancy was impending at the factories in question. The position was, he thought, that some contracts were ending and as a result some discussions were going on with the unions and some reduction of the hours worked weekly had been agreed in order to avoid redundancy. If those methods did not work, he supposed it was possible that there would be some redundancy but the present position was not unhopeful, although it was one which he must watch.

Expansion of Nuclear Programme

Asked by Mr. Gresham Cooke if he was now in a position to make a further statement about the expansion and acceleration of the Government's atomic energy programme, the Paymaster-General said that the review of the programme had not yet been completed.

Hire Purchase of Cookers and Water Heaters

Replying to Mr. Frank Allaun, Sir David Eccles, President of the Board of Trade, said he had recently received representations from the North Western Gas Consultative Council about the effect of the hire-purchase restrictions on gas cookers and gas water heaters. He had no intention of relaxing the restrictions on gas or electric cookers and water heaters at the present time.

London Airport Rail Link

Mr. David Jones asked the Minister of Transport what progress had been made in the provision of a rail link between the centre of London and London Airport.

Mr. Watkinson said the Committee set up by the British Transport Commission to study this matter was now considering the interim report of the survey carried out by the consulting engineers.

Electricity Bill in Committee

CONSIDERATION of the Electricity Bill by a Committee of the House of Commons began on Tuesday. A Government amendment was carried advancing the date for the dissolution of the Central Electricity Authority and the setting up of the Electricity Council and Central Electricity Generating Board from 1st April, 1958, to 1st January, 1958.

Mr. Reginald Maudling, the Paymaster-General, told the Committee that the nuclear power programme "about which much will be heard in the months ahead" was one reason why the change-over should take place as quickly as possible.

Mr. W. N. Warbey (Labour) said he felt that we could still retain the Central Electricity Authority but take away its functions on the generating side and set up a special Board for this, leaving the existing Authority with its supervisory and planning functions. Mr. Maudling said he would give reasons for the changes at later stages of the Bill.

Mr. David Renton, Parliamentary Secretary, Ministry of Power, referring to the proposal that the Generating Board should have power to provide bulk supplies to electricity undertakings outside Great Britain, said, "The sort of case one has in mind is of selling electricity to France when we have a Channel cable available." Because France might want to use the electricity, and not merely distribute it, Mr. Renton proposed an amendment, which was accepted, adding the words "or use" to the clause covering distribution.

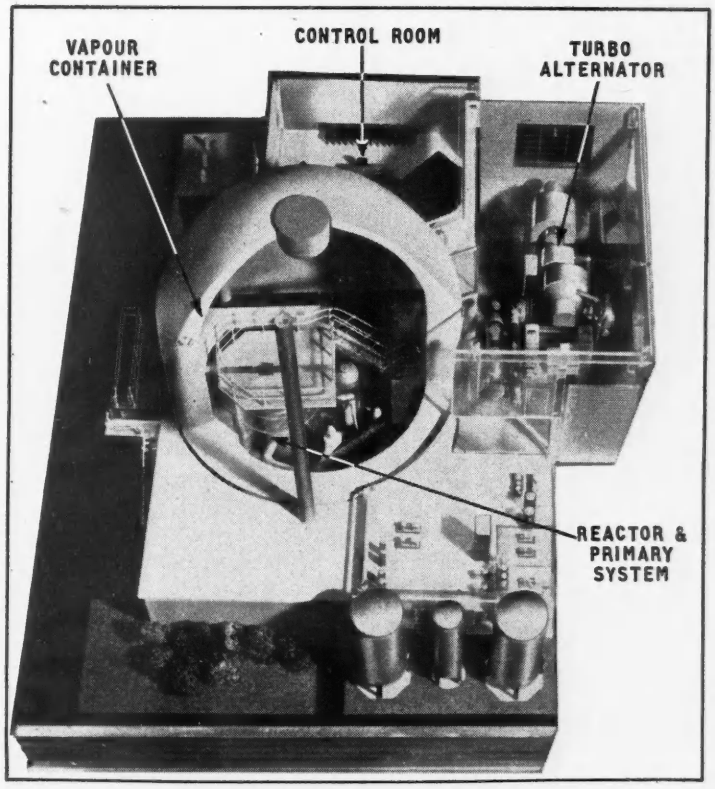
The Committee adjourned until yesterday (Thursday), having dealt with five of the 76 amendments on its Order Paper.

Edmundsons Group Conference

Sir Nutcombe Hume, chairman of the Edmundsons Group, opened the first combined conference of executive and branch managers of the three wholesale companies in the group held recently. It took the form of a panel which included Mr. A. H. Young (vice-chairman), Messrs. E. H. Maltby and N. G. Smith (joint managing directors) and Messrs. G. H. Bowles, D. Donne and A. G. Lindars (directors) who led the discussion on questions submitted by branch managers. On the day preceding the group conference separate conferences were held at which the respective general managers of Alliance Wholesale, Ltd., Simpson, Baker & Co., Ltd., and the Sloan Electrical Co., Ltd., dealt with matters arising from questions submitted by their branch managers.

SMALL NUCLEAR POWER PLANTS

British Company to Sell from American Prototype



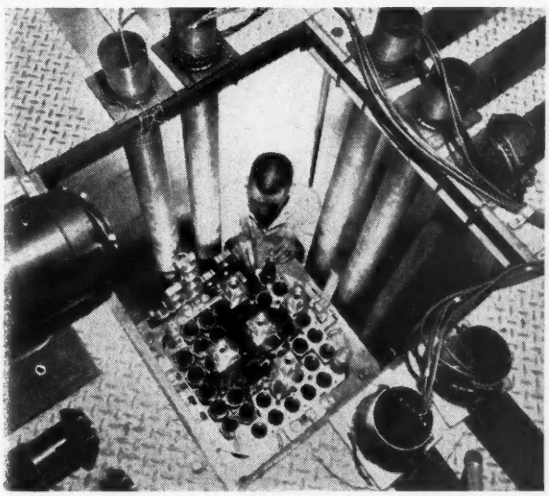
Cut-away model of the Alco 10 MW nuclear generating plant for the U.S. Army which is due to be commissioned very shortly

AT a Press conference last week it was announced that small nuclear power plants, economic for export and modelled on a full-scale American prototype, are to be built in this country. Humphreys & Glasgow, Ltd., who have selling rights outside the North American continent by agreement with the designers, Alco Products, Inc., of New York, are ready to accept orders at once, with completion times about the same as for conventional plants. Either steam generating plants or complete electric power stations are offered with outputs ranging from 10 MW to 25 MW.

Reactors small enough for industrial use and export are now beyond the experimental stage because of Alco's experience during the past three years in the design and building of a small-scale nuclear generating plant for the U.S. Army. This 10 MW plant is due to begin operating on a commercial scale shortly. Assembled, this plant is extremely compact, occupying an area about the size of a tennis court. The reactor works on the pressurised water system, which has been proved for two years in the U.S. Navy's atomic submarine *Nautilus*.

Although small or medium-sized generating stations installed on an average site will cost somewhat more than an oil- or coal-fired station of similar size, costs of electricity production will be competitive. The cost of a 10 MW plant will be about £2 million and it is claimed that electricity will be produced at 1½d to 2d per kWh.

Technician adjusting a control rod in the core of the Alco reactor nearing completion at Fort Belvoir, near Washington



A major advantage of the nuclear plant is freedom from interruption of the fuel supply by transport difficulties. A year's fuel charge is such a small package that delivery by air is feasible, if necessary. Nearly all plant and equipment for orders taken by Humphreys & Glasgow will be procured in this country so that dollar demands will not be large. Furthermore, no "exotic" materials are employed in the reactor: only those in common use such as mild and stainless steel.

The reactor uses between ½ and 3½ tons of enriched uranium fuel, now obtainable on loan from the United States Atomic Energy Commission under contract whereby supplies are guaranteed for the life of the reactor. Once it has been charged the reactor will run from 18 months to two years without changing fuel elements.

Essentially, the reactor is a pressure vessel filled with water and containing the fuel elements from which heat is removed by circulating the water under pressure. On leaving the reactor this water passes through a heat exchanger and is then pumped back to the reactor. Steam generated in the heat exchanger passes to a turbo-alternator set where electrical power is generated. A high degree of safety is claimed for the design and the vapour container will give complete protection in the unlikely event of any "incident."

The demand for these small and medium-sized plants is likely to come chiefly from communities or industrial

concerns in areas where the cost of fuel is high and the long-range transmission of power is uneconomical, as for example, in remote or thinly populated places. Reactors of this type are also suitable as prototypes for smaller countries seeking to gain operating experience of nuclear power plant at a comparatively low capital cost.

Humphreys & Glasgow, Ltd., have had 64 years' experience in the design and erection of heavy plant for the gas, chemical, oil and other process industries. Altogether, the company has built more than a thousand installations in many parts of the world and a few weeks ago was awarded the contract for the National Coal Board's underground gasification scheme. The company's nuclear energy division will co-operate with Alco in the marketing, engineering and construction of reactors and other nuclear equipment. The company has a branch in Australia, a subsidiary company in Canada and associate companies in France, Western Germany, India, Japan and South Africa.

Alco Products, Inc., formerly the American Locomotive Co., and a century-old pioneer in the railway field, is a regular supplier of equipment to the United States Atomic Energy Commission, and it also supplied important accessories for the *Nautilus*. The company has impressive experimental and research facilities at its Schenectady works. The company is developing other reactor systems, and these will also be marketed outside North America in due course by Humphreys & Glasgow, Ltd.

Distance Relays Using Transistors

TWO papers relating to the application of transistors to high-speed distance relays were presented before the Institution of Electrical Engineers on 30th January by Messrs. C. Adamson (Manchester University) and L. M. Wedepohl (South African Electricity Supply Commission).

The first paper set out the advantages of junction transistors over thermionic valves for power system protection. No theoretical difficulty was found in obtaining a range of distance-relay characteristics with the properties of a straightforward directional relay. The pulse type was unstable compared with the direct-phase-comparison type, though both were extremely subject to " transient over-reach " (the impedance at which a relay just operated expressed as a percentage of the relay setting). Two possible lines of approach to the problem of transient over-reach were suggested. If this problem were solved transistors promised to be highly competitive with electronic equipment for power system distance protection.

In the second paper the authors described further work on a dual-comparator mho-type relay, using transistors which gave marked improvement in accuracy and absence of transient over-reach over earlier transistor relays, though requiring more transistors.

DISCUSSION

Opening the discussion Mr. M. Kaufmann (C.E.A.) said that the transistor had arrived at a time when the gap between the performance of electronic components and the requirements of protection had been virtually closed and they were now on the threshold of another era. The same high hopes had been entertained for the electronic component and its performance, but if these hopes were to be realised no protective system or relay based on transistors should be marketed until the reliability of the transistor had been proved under conditions simulating the worst to be met in service.

Mr. C. Ryder (Metropolitan-Vickers Electrical Co., Ltd.) expressed the opinion that the line of investigation of the authors was well worth pursuing and had a future. Some of the enthusiasm for electronics was damped by the need for auxiliary power supplies, but the reduction in such requirements with transistors presented a different aspect. Another problem, to the solution of which transistors might contribute, was the need for making protective equipment proof against workmen dropping weights, drilling panels, centre punching and all the usual rebuilding after equipments had been put in commission, as well as against rough handling during transport.

Mr. T. H. Walker pointed out that transistors, through conservation of power, especially at very low levels, and reduction in space, could be designed to give performances unattainable with hard valves. The authors had referred to attempts to reduce the number of transistors used, but it was inadvisable to sacrifice reliability to achieve economy. Transistors were so suitable for electronic switching applications that their use would grow enormously in the near future, thus lowering manufacturing costs.

Mr. J. A. Fitzpatrick (G.E.C.) said that while the schemes described by the authors appeared to give good performance, the case for them as regards reliability and maintenance and economics was " not proven." He drew attention to the importance of feeding electronic circuits on the bench before putting them to work and expressed the view that good results might be obtained in the carrier current field if the need for the present complicated power supply could be obviated.

Dr. F. H. Last said that the present-day protection on high-power transmission lines was complicated to construct, to commission and to maintain. Also it required a lot of ancillary apparatus. It was an overstatement to say that electronic protection had been successfully applied on a wide scale. The authors had, however, approached the problem from the right angle—the users' point of view; small gains should not be attempted at the expense of complication. The authors stressed the importance of the test bench, but the ultimate test bench was out on the system. One of these relays was to be installed in South Africa, but it should be possible to install one in this country.

Mr. A. R. van C. Warrington said it looked as though the limitations of the transistor relay seemed to have been largely overcome. The life of the transistor was as yet unknown, but so far results were good. He was pleased that no strong objections had been raised to miniaturisation, but criticised the large number of components in the three-phase three-step distance relay.

Mr. L. D. Johnson, referring to the power rating of transistors used to operate a relay where the current was increasing slowly, said one could only switch a relay that had about four times the power rating of the transistor. If the transistor could be switched quickly from off to on, very much higher power ratings could be handled.

Mr. J. K. Webb noted that even radio sets, made to a cut price, were surprisingly reliable. Still more so was the superior equipment made for transcontinental traffic. A supreme example was the relays in the transatlantic telephone cable.

Measurement Techniques

I.E.E. Measurement and Control Section Papers

FOUR papers were presented before the Measurement and Control Section of the Institution of Electrical Engineers on 29th January. In the first Messrs. C. E. Richards, E. V. Walker and A. C. Lynch (all of the Post Office Engineering Research Station) described an experimental study of high-permeability nickel-iron alloys. Their aim was economy in the production of alloys of the Mumetal or Permalloy C type, which as produced commercially might be inconsistent in their properties. Designers had therefore to allow for the worst material they were likely to get and not for quoted values. The main constituents of these alloys were nickel, 75 to 80 per cent, and iron, 12 to 16 per cent, and their quoted initial permeabilities were 15,000 to 20,000 for Mumetal and 20,000 to 30,000 for 4-79 Permalloy, which differed from the former in containing no copper.

The authors' investigations showed that the making of such alloys which consistently developed very high initial permeabilities was possible subject to two main conditions. The first was the holding of the composition within limits of $\pm 0{\cdot}2$ per cent; the second was the prevention of oxides within the metal during the final anneal. The resultant metal should then have a permeability of over 30,000 at thicknesses of 50 microns (0·002in) or more and 25,000 at 12 microns.

The first condition arose from the need for low magnetostriction and low anisotropy, both temperature-dependent; the second might require very dry hydrogen during the annealing cycle to avoid damage by water vapour due to the introduction of silicon. The field for such precision alloys would no doubt be limited by cost to products in which size and weight were of paramount importance, as in very thin strip when a core known to have a permeability of 15,000 would be smaller than one possibly of 5,000 (a usual design figure) and need less than one-third of the copper for winding.

Permittivity of Sheet Dielectric

Mr. Lynch was also the author of the next two papers. One presented a method of measuring permittivity of sheet dielectric of 0·5 cm or more and of comparing capacitances of about 10 $\mu\mu$F with an accuracy of $\pm 0{\cdot}005$ $\mu\mu$F. The test specimen was inserted loosely in a prefabricated electrode system and removed after measurement of the capacitance. The electrode separation was then reduced until the capacitance reached its original value, which enabled the permittivity to be calculated without need for knowledge of the electrode area or of the calibration of capacitors. Precision was limited only by difficulty of measuring the thickness of the specimen and errors could be as low as one in a thousand for permittivities of about two.

For ascertaining power factor the method was less sensitive than others, but this defect was usually outweighed by its freedom from uncertainty about spurious effects introduced by the electrodes. Its range extended from 100 c/s to about 1 Mc/s and its rapidity in use made it suitable for routine batch measurements.

The other paper by the same author gave particulars of a new bridge network for precise evaluation of direct capacitance by substitution. The circuit was stated to possess a hitherto unequalled combination of the following advantages: virtual freedom from influence of stray capacitance and conductance; a bridge balance almost independent of frequency; normally no switching; one terminal of both oscillator and detector earthed. The circuit could in principle be used at any frequency for which a transformer could be made, say, 4 c/s to 20 Mc/s, especially for measuring capacitances of less than 100 $\mu\mu$F. Up to 1 Mc/s it was suitable for work of the highest precision.

Transformer Bridge

In the final paper Messrs. W. F. Covering (London University) and D. B. Britten (Postmaster General's Department, New South Wales) described a transformer bridge for quickly measuring at 1,000 c/s the impedance parameters (including imaginary components) of point-contact or junction transistors connected in the common-base circuit. They showed that a bridge with inductively coupled ratio arms could be readily adapted for this purpose and gave particulars of an arrangement of a screened transformer for the detection of an a.c. of less than 10^{-8} A in the presence of a large voltage between the windings. A modification of the bridge connections measured the components of a simple equivalent circuit of a junction transistor. Further modifications suggested would allow measurements of admittance parameters or measurements at radio frequencies.

The discussion was opened by Mr. W. F. Randall (Telegraph Construction & Maintenance Co.) who disagreed with the statement in the first paper that the properties of commercial alloys were inconsistent, holding that the established material compared very well in most cases with the elaborately prepared expensive precision alloy. Except for small special applications users, he believed, would go to the established material. Costly preparation of sintered alloys showed little advantage except in very thin strips.

Mr. C. G. Garton (Electrical Research Establishment), referring to the second and third papers, expressed surprise that the transformer bridge had not come into use, since it had great advantages over the more conventional type. The distinctive feature of the Lynch bridge was the avoidance of stray capacitance.

Dr. R. F. Saxe (Queen Mary College) said that the fourth paper seemed to be an advance on previous work and was a nice application of the transformer bridge, though he did not think its advantages over previous bridges were made sufficiently clear. He criticised the aural method of detection as 30 kc/s was beyond the range of most ears.

Mr. C. G. Smith (Mond Nickel Co.) said the authors of the first paper had brought to light many interesting facts about the causes of variations in quality of nickel-iron alloys and had described what appeared to be a new technique for the production of high-quality materials, which, however, would be too costly for all applications.

Mr. J. K. Webb (Standard Telecommunication Research Laboratories) asked why Mr. Lynch wanted such a high degree of accuracy. When he was engaged on similar work the emphasis was on power factor and for this the Schering bridge or the bridge of A. M. Thompson, with the Hartshorn-Ward method for the higher fre-

quencies, reigned supreme. He urged, in the light of previous proceedings of the Institution, that the M.K.S. rather than the C.G.S. system of units should be used.

Mr. S. E. Buckley (Standard Telephones & Cables) referred appreciatively to the use of powder metallurgy in the first paper, which enabled elements which caused trouble to be put under better control. He doubted whether the very high permeability alloys would ever be freely usable in the form of laminations because of the effect of strain. They were preferably considered as cores of spiral tape than as tape material for subsequently making up into cores.

Mr. D. Edmundson (British Thomson-Houston Co.) welcomed an independent paper on magnetic materials. There was a certain amount of " hush-hush " as to how these materials were made, which created a suspicion in the minds of users that the inherent complexity in magnetic materials was even worse than nature had made it.

Dr. L. G. A. Sims (University of Southampton) asked for information about ageing characteristics. He thought further comment should be made on the C.G.S. *versus* the M.K.S. system of units, since three of the officers of one of the leading research establishments, colleagues of the President of the Institution, used the C.G.S. system.

Mr. G. Kerr (Henry Wiggin) mentioned the existence for some time of a production unit turning out the type of alloy referred to by Mr. Richards and his colleagues by means of powder metallurgy methods.

Dr. R. Schofield (Telcon) showed a number of slides bearing on the same paper. These indicated the hysteresis loop for 15 micron Mumetal strip wound into a spiral core and heat treated; the relationship between coercivity and strip thickness; the relationship between initial permeability and frequency for 0·0005, 0·002 and 0·004in strip; and the low anisotropy of present-day Mumetal. He hoped that in time designers would take full advantage of the material now available.

Dr. G. A. V. Sowter (Telcon) could not agree that 4-79 Permalloy differed from Mumetal in containing no copper. Permalloy C did contain copper and was presumably susceptible, therefore, to the same comments as Mumetal. With regard to the statement that " designers of electrical equipment normally assume properties greatly inferior to those usually quoted," Mumetal was sold against purchasing specifications with minimum guarantees and no such assumption was made. The accusation might be construed to refer to commercial alloys of any thickness and in any form, but the paper was devoted to thin strip only and this was not made clear in the summary. The whole of the current transformer industry had been operating on minimum guarantee performance over a range of induction for many years and he had yet to find any customer who was of the same opinion as the authors. Inspection was 100 per cent, every core being factory tested.

Investigating Smoke Density

FOLLOWING the publication last spring of B.S. 2740, which described simple smoke alarms and alarm recorders, the British Standards Institution has now issued two further standards in relation to the control of smoke emission. The first of these, B.S. 2811 : 1957, deals with smoke density indicators and recorders which, while costing rather more than the simpler alarms specified in B.S. 2740, give the furnace operator an indication of the actual density of the smoke passing up a chimney at any one instant, and can also make chart records of this. Such instruments, as well as playing their part in the drive to reduce smoke emission, will also be found to be aids to the maintenance of efficient combustion.

On the other hand, B.S. 2741 : 1957 suggests a number of forms of very simple instruments which will be found useful in certain circumstances to supplement the information given by photo-electric instruments of the type specified in B.S. 2740 and B.S. 2811. The underlying principle in these simple viewers is that a beam of light is partially obscured by a column of flue gas and either viewed directly or by reflection or on an opalescent screen. They will not provide quantitative information on the amount of smoke passing, but will be found particularly useful in cases where an alarm or indicator is fitted on chimneys common to several furnaces. A simple smoke viewer used on each of the furnaces will then indicate to the fireman the particular furnace which is responsible for an undue emission of smoke. Both B.S. 2811 and B.S. 2741 may be obtained from the British Standards Institution, 2, Park Street, London, W.1, the prices being 3s 6d and 3s respectively.

Socket-Outlet Standards

TEN years ago the British Standards Institution published B.S. 1363 : 1947 to introduce a new type of standard 13 A socket-outlet with fused plugs for use in a.c. ring main circuits. The standard was for flush-mounted socket-outlets intended to provide an " all-purpose point " for up to 3 kW, and since its introduction it has been widely applied in domestic installations. The B.S.I. now announces the publication of Supplement No. 1 (1957) to B.S. 1363 : 1947 and apart from the fact that the sockets specified are for surface mounting, the scope of the standard is identical with that of the parent publication.

Another new standard, B.S. 2814 : 1957, has also been published for switch socket-outlets and this is complementary to B.S. 1363 : 1947, which it closely resembles. All the above sockets are for use with the standard B.S. 1363 fused plug.

Copies of the above publications are available from the British Standards Institution, 2, Park Street, London, W.1. Supplement No. 1 (1957) to B.S. 1363 : 1947 price 1s 6d and B.S. 2814 : 1957 price 3s.

Radio Communications Exhibition

A FOUR-day exhibition and series of demonstrations of radio communications equipment was held last week by Marconi's Wireless Telegraph Co., Ltd., at its Writtle development laboratories, near Chelmsford, Essex. Wide-band radio links carrying multi-channel telephony and television signals have in recent years become widely appreciated as attractive alternatives to cable systems, particularly across undeveloped areas. The company has played a leading part in the planning and installation of multi-channel radio relay systems all over the world and, in collaboration with the Automatic Telephone & Electric Co., Ltd., is able to provide complete systems to suit all requirements.

Last week's exhibition displayed the principal types of equipment used in such projects and showed how it can be used for all applications from simple point-to-point links to complex main trunk systems carrying several super-groups of telephone channels or a television signal. The exhibition was in two sections, the first being a static display of equipment and accessories, and the second a demonstration of v.h.f. and microwave equipment under operational conditions. Here the equipment carried wide-band signals, including colour television, over typical radio paths. In addition, visitors had the opportunity of seeing a mobile s.h.f. multi-channel system and a v.h.f. single-channel " subscribers " system in operation. The static display also included a selection of test instruments used in the development, installation and maintenance of multi-channel links.

Nuclear Power for Scotland

DESIGN OF 320 MW PLANT

FURTHER details can now be given of the design of the nuclear power station which is to be built by the G.E.C.-Simon-Carves Atomic Energy Group for the South of Scotland Electricity Board. Work on the station, which will have an ultimate output of 320 MW, is to begin shortly and the first reactor is scheduled to become critical in 1960-61. The station is basically similar to Calder Hall but with many refinements in design which should result in a much higher operational efficiency. There will be two reactors, each associated with eight heat exchangers, and a total of six 60 MW turbo-alternator sets.

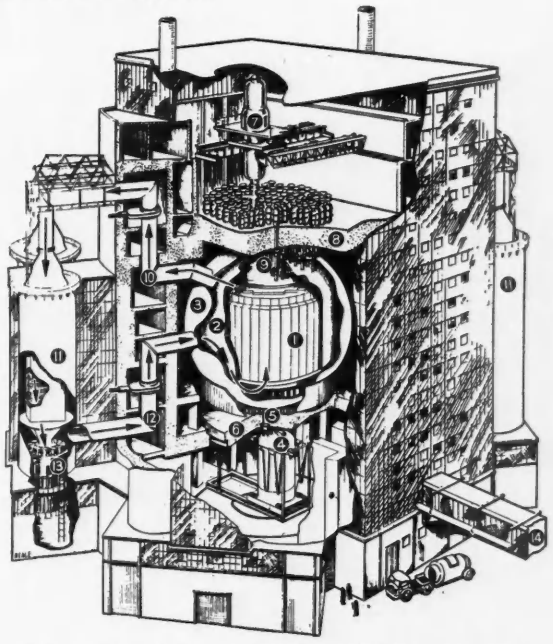
Starting with the reactors: the 2,000 ton cores are built up of accurately machined graphite bricks and tiles to form a cylinder 50ft 6in in diameter and 28ft high. The central portion of this structure is the core proper containing the fuel and control rod channels; the remainder acts as a reflector to reduce neutron leakage. In the core there are 3,288 vertical fuel channels arranged in the form of a square lattice with a pitch of 8¼in. These are sub-divided into groups, in the centre of each of which is a further channel for a control rod.

The reactor fuel is natural uranium and each fuel element is in the form of a cylindrical rod of 1·15in diameter and 24in long, weighing nearly 17 lb. The fuel cans are of magnesium alloy with extended surfaces in the form of fins. Ten fuel elements constitute the complete charge for one vertical channel and for ease of charge and discharge operations it is desirable that they should be placed one on top of the other in the channel. This imposes considerable stress on the lower elements and may lead to distortion by bowing. The G.E.C. system of fuel element support goes a long way towards meeting these conflicting considerations and confers in addition a number of other important advantages. The essential feature of the design is that each canned fuel element is individually supported and located by non-metallic "spiders" inside a relatively large bore graphite tube.

The main flow of CO_2 heat exchange medium is up the bore of the graphite tube in direct contact with the fuel elements. A small quantity of gas also passes up the annular space between the graphite sleeve and the main moderator channel to extract the heat (about 6 per cent of the total) generated by collision processes in the graphite itself.

Reactor Core

The reactor core rests on support plates on a steel grid which is in turn supported on a steel skirt. The grid is formed of a large number of steel boiler plates some 7ft in depth, arranged in "egg-box" fashion with a thick steel top plate, the space between each section being sufficient to accommodate 36 channels of the reactor. On top of the grid structure is a thick steel plate providing an accurately levelled surface for the erection of the core structure. The core itself is surrounded by an inner shell in the form of a cylinder, open at its lower end and with a dome at the top. This shell is made of relatively thin boiler plate. Completely enclosing the core, grid and inner shell is a spherical pressure vessel 70ft in diameter. This will be fabricated on site from steel plates 3in thick.



1. Reactor core. 2. Inner steel shell. 3. Spherical pressure vessel. 4. Charge-discharge machine. 5. Charge-discharge standpipes. 6. Lower concrete shield. 7. Reactor servicing machine. 8. Upper concrete shield. 9. Control rod standpipes. 10. Hot gas duct. 11. Steam raising unit. 12. Cool gas duct. 13. Gas circulator. 14. Pipe bridge to turbine hall

Sectional elevation of one of the reactor buildings (arrows show direction of gas flow)

Carbon dioxide at a pressure of 150 lb/sq in will be blown into the outer spherical vessel via eight 5ft diameter ducts situated at "equator" level. The cool gas then passes downwards between the outer and inner vessels, and upwards through the support grid and the core channels.

Completely surrounding the reactor is a concrete biological shield. At the base of the reactor it is 6ft thick, increasing to 9ft at the sides, while the roof shield is 10ft 6in thick.

Charge-Discharge Machine

All fuel charge and discharge operations for each reactor are carried out by a single multi-purpose machine working in a shielded chamber below the reactor. All operations can be carried out under pressure and while the reactor is on load. At no time during the charging and discharging operations does the controller see the machine (except through television monitor screens), all movements being remotely controlled from a room in the reactor building.

The charge machine vessel is approximately cylindrical, 30ft high, and capable of withstanding the full gas operating pressure. It is seated in a carriage mounted on four wheels. Thus, by rotation of the turntable and movement of the carriage along it, the nozzle in the top of the charge machine can be aligned directly beneath any one of the 101 standpipes emerging from the underside of the reactor pressure vessel. Each standpipe serves 36 channels in the reactor.

A cooling pond for spent fuel is situated between the two reactors and is common to both of them. The capacity of the cooling pond is such that the complete fuel charge from one reactor can be dumped into it in

the event of an emergency, as well as the normal number of cartridges issuing from one running reactor.

Altogether 208 channels in the reactor core can be used for control rods, and each is associated with 16 fuel channels. In practice, not all of these channels will contain control rods. Access to the control rod channels is obtained from above the reactor through tubes passing upwards from just above the core, through the inner and outer shells, and through the upper biological shield, terminating in a set of 208 larger diameter standpipes.

The control rod mechanism consists of a flexible stainless steel wire rope wound on a conically shaped drum driven by a low-frequency permanent magnet motor. Each 21ft long boron-steel control rod is moved in or out of the core by applying a three-phase low-frequency supply to the motor stator; the rods are held out of the core by reducing the frequency of the supply to zero, i.e. a d.c. condition. The control rods are divided into four groups—two coarse control, a fine control and a safety group. The two coarse groups are capable of a combined reactivity control of 4·85 per cent. The fine group controls 0·4 per cent reactivity and the safety group 1·25 per cent.

Burst slug detection equipment is installed to detect the escape of radioactive fission products due to failure of a fuel element, and to locate the channel containing the faulty element so that the reactor and gas circuit may be safeguarded from the release of fission products.

The eight heat exchangers associated with each reactor are grouped in pairs round the reactor; their function is to remove heat from the circulating gases and raise steam for driving the turbo-alternator sets. Each heat exchanger shell is of welded construction, 19ft 6in diameter internally and 73ft 6in high overall, and will be fabricated and erected by the Motherwell Bridge & Engineering Co., Ltd. The hot gas flows downwards across banks of self-draining multi-loop tube elements which form the economiser, evaporator and superheater sections. The inlet gas temperature will be about 750 deg F and the outlet temperature 400 deg F. The quantity of gas circulated through the reactor-heat exchanger system is large, amounting to over 5,000 lb/sec. One gas circulator is situated on the base of each heat exchanger, so that it handles the gas at the lowest temperature. These duty requirements call for a single-stage 2,200 h.p. 1,000 r.p.m. fan.

Steam Cycle

A " double pressure " steam cycle has been adopted so the heat exchanger has two independent boiler systems, each comprising economiser, evaporator and superheater sections. These sections are so arranged in the gas stream that the best use is made of the temperature differences available for heat transfer. The double pressure boiler is used with a pass-in turbine in which the low-pressure steam is admitted to the turbine at an intermediate stage of the expansion. This has the effect of improving the turbine efficiency and the steam dryness at the turbine exhaust and obtaining the advantage associated with the reheat cycle used in fuel-fired plants. The pressures and temperatures employed are 575 lb/sq in at 700 deg F and 145 lb/sq in at 670 deg F in the high- and low-pressure sections respectively.

The turbine hall contains six dual-pressure G.E.C. 60 MW c.m.r. turbo-alternator sets, with hydrogen-cooled alternators working at 30 lb/sq in. Three sets are associated with each reactor, arranged so that each reactor, with its heat exchangers, the three turbo-alternators, ancillaries and steam dumping equipment can be operated as a unit. Provision is made for interconnecting the steam and feed ranges of the two unit systems. The turbine design follows the general features of the conventional G.E.C. 60 MW unit, incorporating where appropriate the new design features developed for the company's 120 MW and 200 MW reheat turbines. A comprehensive system of manual controls and instrumentation for the two reactors and their associated plant is provided in a central control room.

TITANIUM STEAM CONDENSER TUBES

THE accompanying illustration shows a part of the open end of a steam turbine condenser equipped with titanium tubes at the Uskmouth power station, Newport, Mon. Imperial Chemical Industries, Ltd., have established by exhaustive laboratory tests that titanium has a phenomenal resistance to many corrosive media, particularly seawater, and now, in co-operation with the controller of the South Wales Division, Central Electricity Authority, the company is carrying out long-term trials in which a number of titanium tubes are being exposed, under normal service conditions, to a particularly aggressive estuarine cooling water. The tubes are solid-drawn from I.C.I. Titanium 130.

Condenser with titanium tubes at Uskmouth power station

Lightning Protection

Design considerations for lines and substations are discussed in a recent report of the Electrical Research Association, Ref. S/T94, " Lightning Protection of Tropical Transmission Systems," by R. H. Golde, Ph.D., D.Sc., M.I.E.E. (price 1s). It deals with the routing for lines, protection by earth wires, shielded wood-pole lines, fully-insulated wood-pole lines, expulsion tubes, arc-suppression coils and automatic reclose breakers. Then the protection of the substations associated with such transmission lines is described, including the protective zone adjacent to the substation, rod gaps, surge divertors and protection necessary for rotating machinery.

Engineering in Europe

ABSTRACTS FROM FOREIGN TECHNICAL JOURNALS

THE layout of a sub-transmission—or primary distribution—system for a given supply area poses some technical, and mainly economic, problems which are complicated by the interrelation of a number of parameters of which the number and length of the h.v. feeders (6 or 22 kV in Czechoslovakia), number and location of the transformer stations (on the assumption of one central distribution station), losses in the interconnected system and the transformers are the most important. Although there are several known methods of solving these problems, they are all awkward and laborious. That is why the author set himself, and solved, the problem of finding a general solution based on the simplifying assumption of a completely regular interconnected system forming a square with the distribution station at the centre and transformer stations at every mesh point, so that the number of these stations is a square.

Proceeding step by step and solving first the problem of the most economic number and length of feeders, the losses in the interconnected system and the transformers, he finds a relationship between these decisive parameters expressing an economic optimum condition. Moreover, this relationship leads to a differential equation for the economic optimum size of the area transformer on the basis of the assumed or estimated load density of the supply area. This solution is independent of variations of prices of basic materials and obtainable without very laborious calculation. —"General Layout of a Sub-transmission System and Determination of the Losses in an Interconnected System," B. Pavlovsky, *Elektrotech. Obzor*, Vol. 45, No. 9, pp. 458-465, 1956, in Czech.

Relay Protection

Longitudinal capacitive compensation has a marked effect on the operation of relay protection. For this reason the layout of the capacitor banks and their location has to take account of the dangers of interference with the existing or planned protective installations, also where the matching of the divertor protection of the capacitor banks with the relay protection of the power system is concerned. In the case of transverse compensation, where the capacitive reactance is smaller than the inductive reactance of transformers and synchronous condensers, the conditions for the operation of the system protection are more favourable.

The degree of longitudinal compensation of transmission lines may be increased where protection circuits use symmetrical components (and h.f. channels), particularly if they are combined with trip coils. The location of capacitor banks at the midpoint of a line produces comparatively favourable conditions for the operation of distance and differential-phase h.f. protection with current-type starting elements. Capacitive compensation restricts the possibilities of using transverse directional differential protection on parallel lines and practically excludes their use when the capacitor banks are erected on the protected lines. The degree of capacitive compensation of single lines may be increased by using negative and zero-sequence directional protection with filters and compensation of the current in the circuits of the voltage coils.—"Effect of Capacitive Compensation on the Operation of Relay Protection," V. M. Ermolenko and S. Ya. Petrov, *Elektrichestvo*, No. 9, pp. 48-53, 1956, in Russian.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

Sintered Contact Materials

The wide range of interesting applications of products of powder metallurgy has in recent years been extended to include the important field of electric contacts, which is a particularly good illustration of the inherent advantages of the method, since contacts have to stand up to severe and combined stresses of different kinds, viz. electrical, mechanical and thermal. It is understandable that development work in electric contacts using this modern technique is proceeding in all the industrial countries and that, whilst the general lines of progress run parallel, one or another country might be temporarily in the lead.

The author presents a well-considered and documented account of recent successes of the Czechoslovakian industry, ably supported by the Research Institute for Powder Metallurgy in Brno, particularly dealing with the development of W-Ag and W-Cu compositions which revealed new facts on the sinterability of tungsten. The most important practical result was the production of a new series of sintered materials of the system W-Ag-Cu-Ni (with up to 97 per cent W) with characteristics approaching forged tungsten, i.e. high resistance to oxidation and electric erosion. These materials compare favourably with the corresponding products of the British industry, and also with materials produced in other countries. The application described is taken from the production of contacts for an air-blast circuit-breaker.—"Production and Characteristics of Sintered Contact Materials," Z. Ministr, *Elektrotech. Obzor*, Vol. 45, No. 9, pp. 453-458, 1956, in Czech.

Overhead Line Supports

The method of strength calculation stipulated by the building regulations of the U.S.S.R. is based on the quotient of ultimate strength of the material by safety factor. This leads to economic disadvantages and should be replaced by considerations based on limiting stress states. There are three such states, the first and third of which are important, particularly in the case of ferro-concrete masts. The first state may be termed that of the normal bearing capacity, the third being defined by a certain width of cracks in the concrete. Between these is the second limiting state, characterised by excessive deformation under static and dynamic loads.

The principle of these calculations is exemplified by cases of steel, wooden and concrete supports and compared with the standing practice in other countries, particularly with reference to the use of "antivibration" conductors. It is then shown that mechanical strength calculations based on the author's principle lead to considerable savings in the case of lines on wooden poles and steel masts without impairing, in some cases even increasing, the reliability of the mechanical construction of the lines. The latter case occurs when and where it is possible to eliminate weak points and simultaneously to reduce the number of supports.—"Calculation of Overhead Line Supports and Conductors from Limiting Stress States," O. G. Vekselman, *Elektrichestvo*, No. 9, pp. 53-59, 1956, in Russian.

INDUSTRIAL NEWS

Electrical Engineers Exhibition

Following recent Cabinet changes Lord Hailsham, who has succeeded Sir David Eccles as Minister of Education, will now open the sixth Electrical Engineers Exhibition at Earls Court on 9th April. It is appropriate that the Minister should open the exhibition since one of its main features will be a 7,000 sq ft exhibit devoted entirely to the subject of education in Britain's electrical industry. Among Services, Government Departments, industrial organisations and individual firms who will take part in this feature are the Electrical Contractors' Association, the Electrical Trades Union, the Royal Navy and several technical colleges. Another feature will be an Employment in Industry Exhibit which will be devoted to showing openings in the electrical industry.

Dish Washing Machines for Germany

An export order for approximately 17,000 "Dishmaster" washing-up machines with a value of about £750,000 was signed in Munich on 30th January between Dishmaster (London), Ltd., and Hauser & Gerard KG (Munich). Three models of the "Dishmaster" are made, two for domestic use and one for commercial premises (restaurants, canteens, hospitals, etc.). Delivery of the German order, which includes all three models, will commence immediately and will be spread over five years.

New Laurence, Scott Offices

New offices have recently been completed at the Gothic Works, Norwich, of Laurence, Scott & Electromotors, Ltd. The new building, which is of about 42,000 sq ft floor area, comprises an administration section on the ground level, technical design and estimating departments on the first floor, and a drawing office on the second floor, which is entirely clear of roof supports. The roof provides ample natural lighting and is thermally insulated. A photographic printing department, which serves the drawing office by means of a high-speed lift, is situated in the basement, which also accommodates record storage and a staff tea room. In the design of the building special care has been taken to minimise noise and use has been made of cork flooring tiles and sound absorbing ceiling tiles.

The architects for the building were A. F. Scott & Sons.

Sales Arrangements in Canada

A Canadian concern which has established a division concerned with "air conditioning, heating, ventilating, pumping, humidity control, etc.," tells us that while arrangements are being completed with a number of American manufacturers it would also like to study sales possibilities for British products. It is said that "the mere granting of an agency will not give satisfactory results in most cases." The firm goes on to say:—

"There are many manufacturers who consider that an agency agreement is all they can do to promote sales in this market. You are no doubt aware that we have to meet the local and U.S. competition which assures prompt deliveries, considerable promotion backing, credit, etc. On this last point we should mention that for practically all our British and German principals we are empowered to allow credit according to the information we obtain locally. May we also add that none of our accounts has failed, so far, to meet its commitments (in the hardware line). The matter is somewhat more complicated with engineering products where we should have some arrangement to ensure prompt deliveries, a minimum of spare parts locally available, factory backing as far as promotion and advertising is concerned, etc."

The drawing office in the new premises of Laurence, Scott & Electromotors, Ltd.

Cable for British Railways

The British Transport Commission has awarded to W. T. Henley's Telegraph Works Co., Ltd., the contract, valued at approximately £750,000, for the supply, jointing and supervision of installation of ninety route miles of 33 kV three-core oil-filled cable and pilot/supervisory cable for the British Railways' Kent coast electrification scheme. This scheme covers the electrification of the Southern Region from Gillingham to Ramsgate, and also the Canterbury, Dover and Folkestone lines. The whole installation is required for commissioning not later than 1st December, 1958, and it is anticipated that cable-laying will commence in April next.

List of Abbreviations

Everyone at one time or another comes across an abbreviation for an association which leaves them wondering what it represents. The publication, therefore, by the British Electrical and Allied Manufacturers' Association of a little booklet giving abbreviations for associations, institutions, research and trade associations (with addresses) and for qualifications, etc., is particularly welcomed. Copies can be obtained from B.E.A.M.A., 36, Kingsway, London, W.C.2, price 6d each.

Lighting Conference and Exhibition

The Manchester Centre of the Illuminating Engineering Society is to hold a four-day conference and exhibition, with "Light and Colour in the Home" as its theme, in the Demonstration Theatre, Electricity Service Centre, Town Hall Extension, Manchester, from 19th to 22nd February. Leading companies in the lighting and decorating fields will be exhibiting. The conference is aimed to provide the fullest information on modern lighting and the part it plays in the design of the modern home. Stress will be placed on the "marrying" of light with decoration and furnishings. On the first day Mr. R. T. O. Freeth (Lighting Service Bureau) will deal with "Lighting with a Difference," and on Wednesday Mr. E. Smith (Philips Electrical, Ltd.) will discuss "Lighting in Other Lands." The designer's point of view will be given on Thursday by Mr. D. W. Durrant (General Electric Co., Ltd.), and on the last day

Mr. G. Grenfell Baines will give the architect's viewpoint. The lectures will be attended by representatives of women's organisations, colleges of architecture, building, housecraft and technology, electrical and building trades' federations, and similar bodies. There will be no charge and the general public is also invited to attend. Further information can be obtained from the organising secretary, Mr. A. Wilcock, Lighting Service Bureau, 36, St. Ann Street, Manchester, 2.

Nettle Accessories Subsidiary

Nettle Accessories, Ltd., Manchester, announces that, due to the rapidly increasing demand for its festoon lighting equipment, it has decided to form a new company to deal exclusively with this section of its range of products. The new company, D.R. Illuminations, Ltd., is at Leestone Road, Wythenshawe, Manchester, 22, and all future inquiries and orders (other than export) should be sent to this address. A number of design improvements and additions to the range are in hand and will shortly be available. The new company is to introduce shortly a scheme by which complete festoon lighting equipment can be taken on hire.

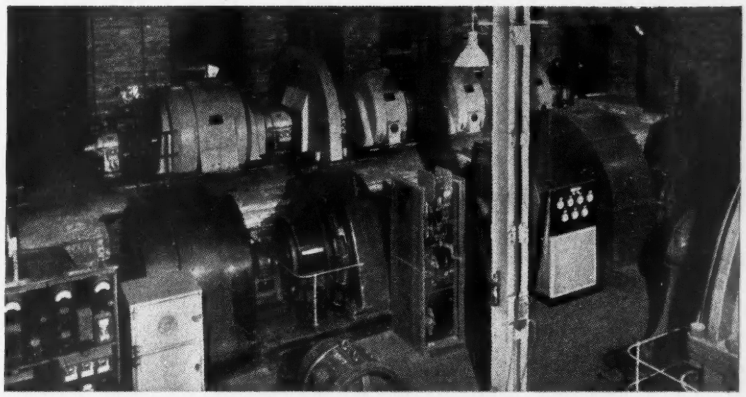
New Zealand's Electrical Imports

After a temporary decline in New Zealand's electrical imports during 1954 the value increased in 1955. The following table shows that in spite of increased local manufacture, the value of motor imports more than doubled during the period under review. As in previous years, cables and wires and telecommunication equipment were the leading items.

Class	1954 (£000)	1955 (£000)
Motors under 1 h.p.	318	788
,, 1 h.p. to 25 h.p.	168	358
,, exceeding 25 h.p.	36	149
Generating sets and magnetos	925	not available
Transformers and convertors	842	931
Other electrical apparatus	2,769	6,063
Insulated cables and wires	1,645	2,706
Insulators and parts	129	95
Lamp bulbs	141	236
Lamps (not surgical)	598	664
Batteries and cells	126	64
Telegraph and telephone appar.	1,216	1,581
Radio valves	201	783
Vacuum cleaners and parts	311	207

Birmingham Engineering Centre at Continental Trade Fairs

Following its successful participation in last year's Vienna Trade Fair, the Birmingham Exchange and Engineering Centre has decided to participate in three overseas trade fairs in 1957. These are the Leipzig Technical Trade Fair (3rd to 14th March), the German Industries Fair, Hanover (28th April to 7th May), and the International Autumn Trade Fair, Vienna (8th to 15th September). At Leipzig the Engineering Centre will set up an office at the Fair headquarters, and will provide visitors with information on the sources of supply of British engineering products and will generally act as an information bureau on the British engineering industry. In Hanover it will co-operate with the Board of Trade in the British Government inquiry office and will handle all engineering inquiries. At Vienna the Centre will work on the same lines as last year, handling, by arrangement with the Board of Trade, all engineering inquiries received at the British Pavilion. The Committee of the Centre is anxious that all British exhibitors at these three overseas exhibitions should take full advantage of the Centre's services and, whether members or not, they are asked to supply literature on their products, in German if possible, to the Centre in advance.



New motor generator set installed by Steel, Peech & Tozer, Rotherham, showing the old set in the foreground

Generating Plant for Cogging Mill

The recent inauguration of a new motor generator set for the 42in cogging mill at Steel, Peech & Tozer, Rotherham, has led to a substantial increase in the mill's throughput of steel. This will be stepped up still further in August, when a new main mill motor is to be commissioned. By the autumn of 1957 it is expected that the cogging mill will be handling 24,000 tons of ingots per week compared with the 1956 weekly average of 18,500 tons. All the extra steel will be absorbed by the company's Brinsworth continuous medium strip mill, which starts up in the middle of April.

The first stage of this £400,000 modernisation scheme has involved the installation of the new motor generator set alongside the existing 35-year-old set. To accommodate the new unit, the motor room has been extended by 21ft on a 74ft span; a new substation has been built to house the h.v. switchgear, as well as a new filter and fan house to supply filtered air for the motor generator and main mill motor. The new set, comprising a 5,000 h.p. induction motor, three generators and a 30-ton flywheel, has a continuous rating of 5,600 kW and a peak rating two-and-a-half times higher. All bearings are flood-lubricated and there is provision for high pressure lubrication of the flywheel bearings for starting-up purposes. The complete unit has been made and installed by the British Thomson-Houston Co., Ltd., within eighteen months of placing the order.

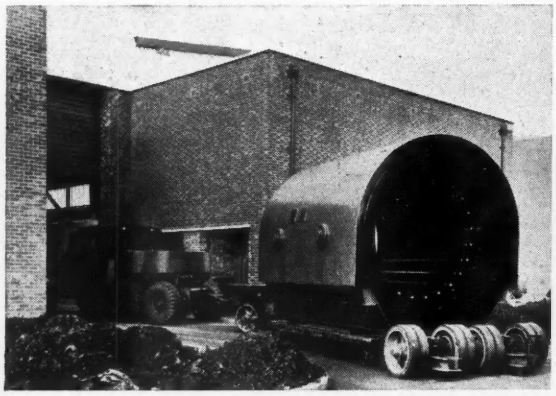
Preparations are now in hand for the second stage of the scheme—the replacement of the main cogging mill drive. Like the old motor generator set, the existing 6,000 h.p. drive is 35 years old. The new motor will have a continuous rating of 7,000 h.p. with a peak rating of 17,500 h.p. and a speed range of 0-50-100 r.p.m. Another B.T.H. installation, it will be laid down during the annual stop weeks in readiness to commence production at the end of August. Meanwhile, the old motor generator set is being dismantled and three new exciter sets will be installed on the same site prior to the main drive replacement.

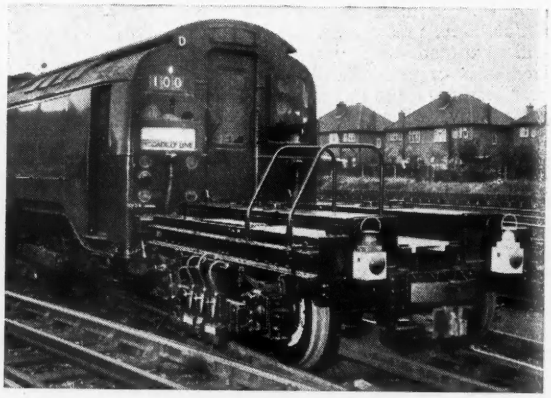
Newspaper Press Order

Vickers - Armstrongs (Engineers), Ltd., has received an order from South Wales Argus, Ltd., Newport, for a three-unit Scott Vickers extra high speed rotary newspaper press. The main drive and control equipment is to be supplied by the Fuller Electrical & Manufacturing Co., Ltd., and will comprise three 65 h.p. commutator motors with continuous speed regulation from crawl to maximum speed without use of barring motors. These drives will be coupled directly to the press through flexible couplings and clutched gear boxes.

Batti-Wallahs' Society

Last week's luncheon of the Batti-Wallahs' Society was again well attended, and the fact that it was the second luncheon in succession at which the guest speaker spoke on Russia, showed how keenly interested members are in conditions in that country. Last week's speaker was Colonel G. A. Tokaty, one-time professor of aerodynamics at the Zukoff





Left: A 30 MW stator frame arriving at the B.T.H. turbine works, Larne, from Rugby, for the first machine to be cored and wound at the new works. Right: Prototype sleet tender developed by London Transport. The de-icing equipment consists of crushing rollers, steel brushes and de-icing sprays

Academy, Moscow, who surveyed the political scene. Mr. W. C. M. Couch (president of the Society) was in the chair. Mr. T. C. F. Bigland (the "Mate") announced that applications for reservations for the ladies' night on 15th March were being received and he asked those members who had not already done so to notify him of their requirements, as it might be necessary to place a limit on reservations.

Atomic Research Site Approved

Following the recent public inquiry the Minister of Housing and Local Government has given planning permission to the United Kingdom Atomic Energy Authority to establish a research station at Winfrith Heath, Dorset. Expressing his satisfaction that objections on the grounds of interference with water supply and the disposal of radioactive material would be met, the Minister turns to the argument that the natural beauty of the area would be spoiled. He sees no reason why the project need result in the industrialisation or "suburbanisation" of the area. Any interference with the amenities of the area would be outweighed by the national importance of the project, but certain conditions are attached to the consent designed to minimise such interference.

Mobile Shops

At an inauguration ceremony at Castletown, near Sunderland, on 25th January, the first two vehicles of an order for fourteen Smith's NCB electric mobile shops were officially handed over to the Ryhope & Silksworth Industrial & Provident Society, Ltd., by Mr. H. W. Heyman, B.Sc., M.I.E.E., managing director of Smith's Delivery Vehicles, Ltd. These vehicles, some designed for grocery and some for greengrocery sales, have an interior layout which enables the customer to see all the goods carried, as in a normal branch shop. The low running costs, and high turnover obtained, make it unnecessary to charge extra for this convenient service. The fleet of mobile shops operated by the Ryhope & Silksworth Society will cater for the districts of Ryhope, Silksworth, Sunderland, Seaham and Castletown.

Pitch Fibre Pipe Association

The formation is announced of the Pitch Fibre Pipe Association of Great Britain. The P.F.P.A. aims to promote and extend the use of British pitch fibre pipes in this country and overseas, and to make known their special characteristics and qualities, uses and techniques of installation. The Association has four founder members: The Key Engineering Co., Ltd., Brookgate Industries, Ltd., Limehouse Paperboard Mills, Ltd., and Union Fibre Pipes (Great Britain), Ltd.

At the inaugural meeting on 21st January Mr. J. E. Ordish was elected chairman and Mr. D. Kirkness vice-chairman. Mr. C. J. Thorne, O.B.E., was appointed secretary and treasurer. Inquiries concerning the Association should be addressed to Mr. Thorne at 27, Chancery Lane, London, W.C.2 (telephone: Chancery 6001).

New R.C.E.E.A. Section

The Council of the Radio Communication and Electronic Engineering Association has approved the formation of a section to deal with electronic data processing, to be known as the Data Processing Section. The chairman of the section is Mr. C. Metcalfe, managing director of E.M.I. Electronics, Ltd., and a Data Processing Technical Sub-Committee has been formed.

Conductor Rail De-icing

A further development by London Transport in the endeavour to prevent winter train delays due to conductor rail icing is the use of sleet tenders attached to the front and rear of an empty service train. One prototype tender has already been completed at the Acton Works and another is under construction. The two will shortly undergo tests on the western section of the Piccadilly Line. Apart from the much lower initial and maintenance costs, the tender has a particular advantage over a locomotive in that no special crew is required. The de-icing equipment, fitted to a specially constructed four-wheel bogie, is similar to that of a sleet locomotive, i.e., three sets of crushing rollers, steel brushes and de-icing sprays. One of the three sets deals with the central negative rail and the other two with the positive rail.

Electrical Commercial Travellers' Handbook

The 1957 edition of the handbook of the Electrical Trades' Commercial Travellers' Association sets out the objects of the Association and the benefits in which members can participate. Lists of officers in London, and of the Midlands, North Western and South Wales Branches are given, and Mr. F. J. E. Simons, the national chairman, contributes a message. An application form for membership is included. The hon. general secretary of the Association is Mr. W. J. Clews-Garner, 104, Howlands, Welwyn Garden City. Members should note that the address of Mr. C. K. Heffernan, hon. subscription secretary, is now 49, Lenham Road, Sutton, Surrey.

Electrical Training in Scotland

The Scottish Electrical Training Scheme has been developed over a considerable period and has now reached the point where an office has been taken at 127, St. Vincent Street, Glasgow, as headquarters. The basic function of the scheme is to provide adequate and co-ordinated facilities within the Scottish electrical industry for the training and employment of students from Great Britain and Northern Ireland. A number of leading companies on the manufacturing side as well as the North of Scotland Hydro-Electric Board and the South of Scotland Board are co-operating to provide training facilities in the form of pre-college, vacation and graduate

stage training on practical lines. Among the companies which are co-operating with the Boards and the Scottish Council (Development and Industry) are Bruce Peebles & Co., Ltd., the Harland Engineering Co., Ltd., Scottish Cables, Ltd., Honeywell-Brown, Ltd., and the Belmos Co., Ltd. The leading technical educational bodies are also participating.

Pakistan Lamp Industry

The *Board of Trade Journal* reports that the two-year period of protection granted to the incandescent electric lamp industry of Pakistan lapses on 17th March. The Government is, however, to review the case for continuance of protection if the industry applies for it by the end of this month.

Gauge and Tool Exhibition

The fifth exhibition organised by the Gauge and Tool Makers' Association will be held in the National Hall, Olympia, London, from Monday, 12th May, to Wednesday, 21st May, 1958, inclusive.

Appliance Factory in Eire

A new electrical apparatus factory, a branch of the Couper Works of Maarssen, Holland, will be opened at Ashford, Co. Wicklow, in April. When in full production the new factory will employ 500 workers. Among the many electrical appliances to be manufactured at the factory are washing machines, vacuum cleaners, refrigerators, dryers, polishers and electrical tools.

East African Electrical Imports

In 1955 the United Kingdom held its position as the main supplier of electrical goods to East Africa; this country's share increased from £3·4 million in 1954 to £5·1 million in 1955. This was achieved in spite of growing competition from Western Germany and Holland. While Western Germany competes in all lines of electrical equipment, competition from Holland is mainly restricted to electronic products. As in former years, Kenya remained the most important market. The accompanying table, showing the principal electrical imports, reveals the marked increases in imports of power plant, cables and radio sets.

Ships' Electric Motors

Laurence, Scott & Electromotors, Ltd., has supplied electric motors totalling over 8,000 h.p. for the drive of engine room and other auxiliaries on the liners *Statendam, Empress of England* and *Sylvania.*

Pumps for Dutch Power Stations

The Harland Engineering Co., Ltd., has received two orders for the manufacture and supply of its latest type of boiler feed pump for power stations at Nijmegen and Buggenum in Holland. The value of these orders, which cover the supply of Harland pumps and motors, amounts to over £165,000. The motors for the Buggenum station are 3,200 b.h.p. whilst those for Nijmegen are 3,000 b.h.p. The Buggenum installation operates against a pressure of 3,550 lb/sq in. The orders were received in the face of intense competition from international pump and motor manufacturers.

Trade Announcements

The **General Electric Co., Ltd.,** announces that, as from 15th February it is adopting revised general conditions of sale, copies of which are available on application to the company.

Enfield Cables, Ltd., announce the following rearrangement of their sales organisation in Scotland. The Glasgow branch has been renamed the Scottish branch and Mr. A. B. MacLean remains in charge of the branch. The company's Edinburgh branch now operates as a depot directly under the control of the Scottish branch manager. The Aberdeen depot has been closed as the result of this rearrangement.

Wild-Barfield Electric Furnaces, Ltd., Watford, has concluded an agreement with Paul Ferd. Peddinghaus, of Gevelsberg, Germany, under which the German concern are appointed sole agents for the sale and service of Wild-Barfield A.H.F. induction heating equipment in Germany, and Wild-Barfield have the right to use Peddinghaus designs of handling fixtures for use on induction heating applications.

Bill Switchgear, Ltd., have appointed Mr. J. A. Pearce as an additional sales representative for the Midlands area. Mr. Pearce has been in the service of the company for four years and previously held appointments in the Design and Sales Departments.

The Rockwell Machine Tool Co., Ltd., have been appointed sole agents in the United Kingdom for the range of machines manufactured by Peltzer & Ehlers, of Krefeld, Germany. The range covers all automatic machinery for the cold production of bolts, screws, rivets, nuts, etc., as well as multiple cold extrusion presses.

The address of **T.D.L. Electrical Distributors, Ltd.,** is now 35, Stapleton Road, Bristol.

The manufacturing activities of the **William Birch, Ltd.,** group are now all undertaken by E. Gomme, Ltd., High Wycombe, and William Birch, Ltd., has ceased to be a manufacturing company. The change is purely one of organisation and there is no change in the activities or policy of the group as a whole.

Air Control Installations, Ltd., have opened a new branch office at Cross House, Westgate Road, Newcastle-on-Tyne (telephone: 28861).

The telephone number of the **British Central Electrical Co., Ltd.,** has been changed to Terminus 3666.

Course on Noise

Following the success of the first course on acoustics held in April, 1956, the Aeronautical Engineering Department of the University of Southampton is to hold another, on similar lines, from 1st to 6th April next. The course is designed for people having no preliminary knowledge of acoustics. It is intended chiefly for those in the aeronautical industry, but there is adequate material to assist all those who have to deal with the increasingly important problems of noise. The fee for the course is £21 including residence in one of the halls of the University. Further details can be obtained from Mr. D. M. A. Mercer, Physics Department, The University, Southampton. Applications should be made not later than 1st March.

EAST AFRICAN ELECTRICAL IMPORTS (£000)

Product	Kenya		Uganda		Tanganyika	
	1954	1955	1954	1955	1954	1955
Generators, motors, alternators, convertors, transformers, switchgear*	561	867	499	839	210	335
Lamps and torch batteries (excl. acc.)	48	50	17	30	29	47
From Malaya	35	44	12	23	21	37
Ditto, n.e.s.	22	47	8	27	22	49
From United Kingdom	12	14	6	18	14	34
Bulbs, arc lamps and tubes for elec. lighting complete	35	54	15	20	20	30
From United Kingdom	13	22	6	10	9	10
,, *Holland*	16	28	8	7	10	12
Radio receivers, domestic	138	219	60	110	142	235
From United Kingdom	40	74	23	46	85	61
,, *Holland*	61	56	26	29	57	75
,, *W. Germany*	31	81	8	29	5	92
Ditto, other, incl. components	164	122	84	41	34	100
From United Kingdom	147	98	29	34	31	87
Apparatus (other than radio) for telephony or telegraphy*	289	205	9	9	73	81
Electro-thermal apparatus, incl. domestic appliances	65	154	45	117	30	110
From United Kingdom	54	109	40	55	25	100
Measuring, controlling, safety & signalling apparatus*	26	34	10	17	10	13
Electro-medical apparatus*	9	17	2	5	7	8
Portable tools and appliances, incl. domestic	54	104	15	22	39	47
From United Kingdom	40	72	10	18	28	36
Insulated cables and wires*	250	255	108	231	121	112
Batteries for motor vehicles	121	119	38	68	70	115
From United Kingdom	77	59	29	48	55	98
Other machinery, appliances and apparatus	187	122	50	149	103	61
From United Kingdom	108	91	47	143	48	47
,, *France*	68	10	—	—	32	2

* Mainly from United Kingdom.

DOMESTIC ELECTRICAL EQUIPMENT

Electric Irons

FOLLOWING electric washing machines and wash boilers, the subjects of our last two surveys, we now turn to what may be described as an almost indispensable item of home laundry equipment, the electric iron. Altogether there are about thirty different makes on the market from which to choose, including non-automatic, thermostatically controlled, steam types and travelling irons.

The iron most in demand is undoubtedly the automatic type which incorporates a bi-metal thermostat to give regulated heating and, in most cases, a pilot light to indicate when the current is on. Thermostatic control also prevents the element from becoming overheated, a common cause of trouble with the older irons. Apart from this there is the added advantage of lower electricity consumption. As an indication of the number of irons of this kind that have been sold during the last few years, one of the leading manufacturing concerns has recently announced the production of its ten-millionth iron.

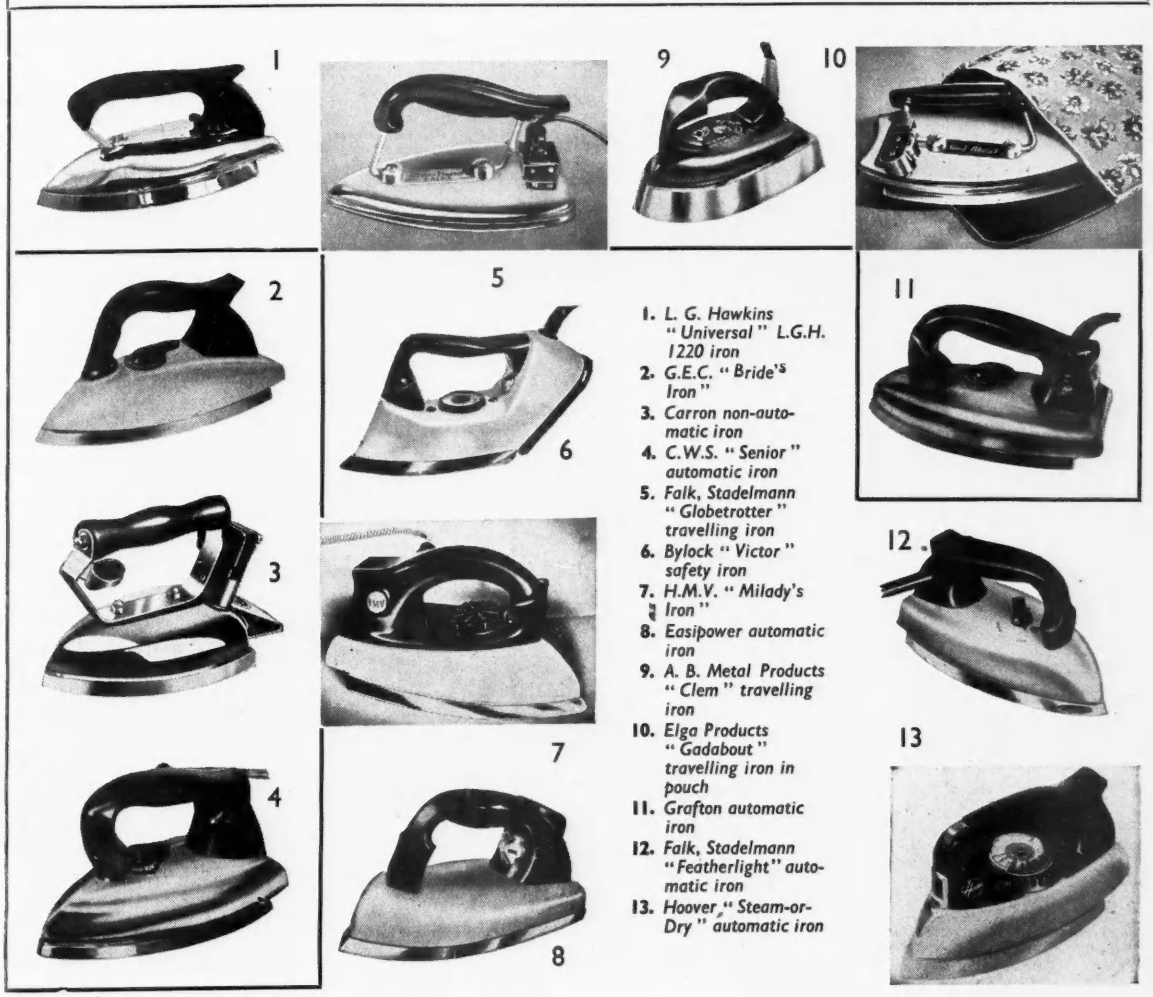
The steam iron, besides eliminating the need for damping-down articles before ironing, can also be used as an ordinary iron. The number of manufacturers remains at three, namely, Hoover, Morphy-Richards, and Kenwood.

Modern electric irons are attractive items of domestic equipment, with their moulded handles and streamlined shapes and, provided they are well treated, are virtually trouble-free and should give years of service. The average weight is in the region of 4 lb and the loading 400 to 500 W for the non-automatic types and 750 W for thermostatic models. Special lightweight irons are also available (1½ to 2 lb) and these are ideal for travelling purposes. Many of these have folding handles and can be used on any voltage between 110 and 250.

Since our last survey of irons the Revo Electric Co., Ltd., has introduced a range of four different coloured finishes in addition to the standard chromium finish, but in general there have been few alterations, either in design or price.

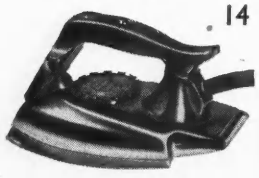
Manufacturer	Name or Model	Type	Weight	Loading	Special Features	Finish	Price (Excl. Tax)	Purchase Tax
A.B. METAL PRODUCTS, LTD., Ynysboeth, Abercynon, Glamorgan.	"Clem"	Travelling	1½ lb	80 W	Universal voltage	Anodised body, chromium sole plate	£1 15 0	£0 7 10
BYLOCK ELECTRIC, LTD., South Street, Enfield, Middlesex.	"Victor"	Automatic, tilting safety	5 lb	750 W	Left or right handed	Pastel-primrose, blue or green	£3 2 6	£0 13 9
CARRON COMPANY, Carron, Falkirk, Stirlingshire.	"Carron"	Non-Automatic	5 lb	450 W	—	Nickel plated	£1 1 6	£0 4 9
CO-OPERATIVE WHOLESALE SOCIETY, LTD., National Works, Hall Street, Dudley.	"Senior"	Automatic	4½ lb	800 W	—	Chromium	£2 5 0	£0 9 11
	"Major"	Non-Automatic	5½ lb	550 W	—	Chromium	£1 10 9	£0 6 9
	"Minor"	Non-Automatic	4½ lb	450 W	—	Chromium	£1 2 0	£0 4 10
EASIPOWER, LTD., 213-215, Gloucester Place, London, N.W.1.	"100/D"	Automatic	5 lb	600 W	Illuminated control knob in handle	Chromium or vitreous enamel	£2 5 0	£0 9 11
	"99"	Automatic	3½ lb	600 W	Illuminated control knob in handle	Cream or primrose vitreous enamel	£2 2 6	£0 9 4
	"99U"	Automatic	3½ lb	600 W	Illuminated control knob in handle, a.c./d.c.	Cream or primrose vitreous enamel	£2 5 0	£0 9 11
ELGA PRODUCTS, LTD., Railway Place, Wimbledon, S.W.19.	"Gadabout"	Travelling	1½ lb	300 W	Fold flat handle	Chromium (*a*) or coloured enamel (*b*)	£2 2 0 (*a*) £1 19 6 (*b*)	£0 9 3 (*a*) £0 8 8 (*b*)
FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1.	"Featherlight" 95658	Automatic	3 lb	750 W	Left or right handed, pilot light	Chromium	£2 2 0	£0 9 2
	"Featherlight" 95659	Automatic	3 lb	750 W	Left or right handed, button contour	Chromium	£1 19 6	£0 8 8
	"Pilot" 95707	Automatic	4⅜ lb	750 W	Left or right handed, pilot light	Chromium	£2 2 0	£0 9 2
	"Standard" 95669	Non-Automatic	4½ lb	450 W	Left or right handed	Chromium	£1 8 6	£0 6 0
	"Globetrotter" 95706	Travelling	2 lb	300 W	Folding handle, 110 and 200/250 V	Chromium	£1 15 8	£0 7 10

Manufacturer	Name or Model	Type	Weight	Loading	Special Features	Finish	Price (Excl. Tax)	Purchase Tax
GENERAL ELECTRIC CO. LTD., Magnet House, Kingsway, London, W.C.2.	" Bride's Iron " D.5850 C.P.	Automatic	2⅛ lb	750 W	Lightweight, snap-action thermostat	Chromium	£2 2 6	£0 9 4
	" Bride's Iron " D.5850	Automatic	3¼ lb	750 W	Lightweight, snap-action thermostat	Cream vitreous enamel	£2 5 0	£0 9 10
	D.5805	Standard	5 lb	450 W	Streamlined	Chromium	£1 12 6	£0 7 2
	D.5827	Travelling	3 lb	300 W	Fold flat handle, universal voltage	Chromium	£2 15 0	£0 12 1
GRAFTON HEATER CO., LTD., 13-15, Westland Place, London, N.1.	DD1	Automatic	5 lb	750 W	Left or right handed, a.c. (*a*) a.c./d.c. (*b*)	Stoved enamel	£1 17 6 (*a*) £2 2 6 (*b*)	£0 8 6 (*a*) £0 9 4 (*b*)
	DD2	Automatic	5 lb	750 W	Left or right handed, a.c. (*a*) a.c./d.c. (*b*)	Chromium	£2 2 6 (*a*) £2 5 0 (*b*)	£0 9 4 (*a*) £0 9 11 (*b*)
L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, Kingsway, W.C.2.	" Universal " L.G.H.1220	Automatic	4½ lb	800 W (a.c. only)	Dial controls include on/off switch	Black, maroon or cherry handle, chromium body	£2 9 6	£0 10 10
H.M.V. HOUSEHOLD APPLIANCES, Hayes, Middlesex.	" Milady's Iron " IC10	Automatic	4 lb	750 W	Left or right handed, pilot light	Primrose vitreous enamel	£1 19 9 £2 3 0 (a.c./d.c.)	£0 8 9 £0 9 6 (a.c./d.c.)
HOOVER, LTD., Perivale, Greenford, Middlesex.	" Steam-or-Dry "	Automatic	3½ lb (dry) 4 lb (filled)	1 kW	Left or right handed	Chromium with brown plastic dial control and handle	£3 17 6	£0 17 6



1. *L. G. Hawkins " Universal " L.G.H. 1220 iron*
2. *G.E.C. " Bride's Iron "*
3. *Carron non-automatic iron*
4. *C.W.S. " Senior " automatic iron*
5. *Falk, Stadelmann " Globetrotter " travelling iron*
6. *Bylock " Victor " safety iron*
7. *H.M.V. " Milady's Iron "*
8. *Easipower automatic iron*
9. *A. B. Metal Products " Clem " travelling iron*
10. *Elga Products " Gadabout " travelling iron in pouch*
11. *Grafton automatic iron*
12. *Falk, Stadelmann " Featherlight " automatic iron*
13. *Hoover " Steam-or-Dry " automatic iron*

Manufacturer	Name or Model	Type	Weight	Loading	Special Features	Finish	Price (Excl. Tax)	Purchase Tax
THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, W.C.2.	Hotpoint "Plus Five" 658C1	Automatic	5½ lb	800 W	Swivel flex, button nooks on sole	Chromium	£3 5 0	£0 14 3
	Hotpoint "Rightweight" HI 101	Automatic	3¾ lb	800 W	Swivel flex, button nooks on sole	Chromium	£2 15 0	£0 12 1
	Premier "Super Smoothwell" 835 : 833	Automatic	5 lb (835) 3 lb (833)	750 W	Pilot light, snap action thermostat	Chromium	£2 5 0	£0 9 11
	Premier "Nine-O-Nine" 909	Automatic	5 lb	1 kW and 800 W	Left or right handed, light in front of handle	Chromium	£4 2 6	£0 18 2
	Premier "Smoothwell" 814	Non-Automatic	4¾ lb	650 W	Hard wearing	Chromium	£1 12 6	£0 7 2
JELSON ELECTRIC, LTD., Spring Road, Tyseley, Birmingham, 11.	MX20	Automatic	4½ lb	800 W	—	Chromium	£2 5 0	£0 9 11
KENWOOD MFG. CO., LTD., Kenwood Works, Woking, Surrey.	"Steam-o-matic" A.801	Steam or dry	3½ lb (dry) 4 lb (filled)	1 kW	Stainless steel construction	Polished stainless steel	£5 7 6	£1 3 7
LINCASS ELECTRIC, LTD., White Hart Yard, Guildford Street, Chertsey, Surrey.	134 and 144 (a.c./d.c.)	Non-Automatic	4½ lb	450 W	Left and right handed	Coloured (134) and chromium (144)	£1 5 6 (134) £1 7 6 (144)	£0 5 7 (134) £0 6 0 (144)
	434P and 444P	Automatic	4½ lb	750 W	Pancake selector dial, left and right handed, pilot light	Coloured (434P) Chromium (444P)	£1 19 6 (434P) £2 2 6 (444P)	£0 8 7 (434P) £0 9 4 (444P)
	436P (a.c./d.c.) and 446P (a.c./d.c.)	Automatic	4½ lb	750 W	Pancake selector dial, left and right handed, pilot light	Coloured (436P) Chromium (446P)	£2 2 6 (436P) £2 5 6 (446P)	£0 9 4 (436P) £0 9 11 (446P)
	444PH	Automatic	6 lb	750 W	Pancake selector dial, left and right handed, pilot light	Chromium	£2 7 6	£0 10 5
	444PHS and 446 PHS (a.c./d.c.)	Automatic	7 lb	1 kW	Pancake selector dial, left and right handed, pilot light	Chromium	£2 12 6 (444 PHS) £2 15 6 (446 PHS)	£0 11 5 (444 PHS) £0 12 2 (446 PHS)
METWAY ELECTRICAL INDUSTRIES, LTD., Canning Street, Kemp Town, Brighton, 7.	DA224 (*a*) DA226 (*b*) and DA225 (*c*)	Non-Automatic	5 lb	450 W	Nickel sole plate	Coloured (*a*), nickel (*b*) and chromium (*c*)	£1 2 4 (*a*) £1 2 9 (*b*) £1 5 0 (*c*)	£0 4 10 (*a*) £0 4 11 (*b*) £0 5 5 (*c*)
	DA439 (*a*) and DA446 (*b*)	Automatic	4½ lb	700 W	Chromium sole plate	Coloured (*a*) and chromium (*b*)	£2 3 9 (*a*) £2 4 6 (*b*)	£0 9 6 (*a*) £0 9 7 (*b*)
	DA186	Travelling	2 lb	150 W	Nickel sole plate	Nickel or coloured	£0 18 6	£0 4 0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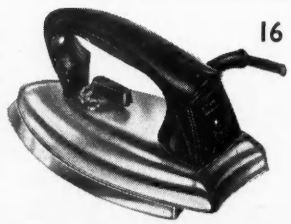
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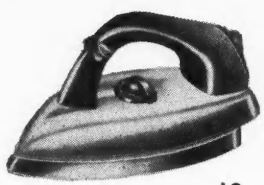
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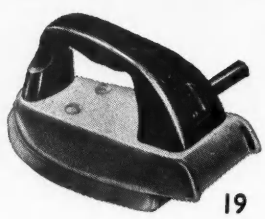
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14. *Hotpoint "Rightweight" automatic iron*

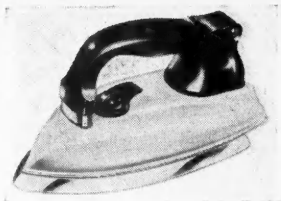
15. *Kenwood steam or dry iron*

16. *Jelson MX.20 automatic iron*

17. *Hotpoint (Premier Division) "Nine-o-Nine" automatic iron*

18. *Metway automatic iron*

19. *Lincass model 134 non-automatic iron*



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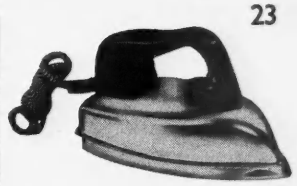

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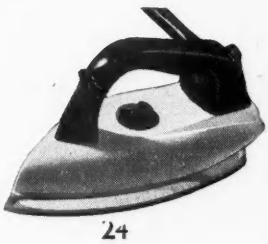

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20. *Morphy-Richards "Senior" CA/75 automatic iron*
21. *Revo "Automatic" iron*
22. *Metway travelling iron*
23. *Pifco model 1042 automatic iron*
24. *Robson "Roblec" automatic iron*
25. *Morphy-Richards ZA/75 steam or dry iron*
26. *Robson "Explorer" non-automatic iron*

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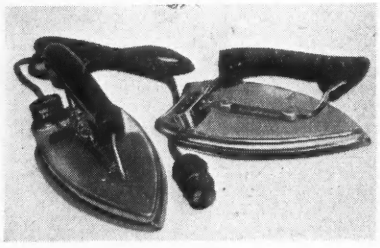
Manufacturer	Name or Model	Type	Weight	Loading	Special Features	Finish	Price (Excl. Tax)	Purchase Tax
MORPHY-RICHARDS, LTD., 6, Conduit Street, London, W.1.	"Senior" CA/75	Automatic	4½ lb	750 W	Pilot light, thermostatic control	Primrose, blue or green (*a*) and chromium (*b*)	£1 19 6 (*a*) £2 5 0 (*b*)	£0 8 7 (*a*) £0 9 9 (*b*)
	"Senior" CU/75	Automatic	4½ lb	750 W	Pilot light, thermostatic control, a.c./d.c.	Primrose, blue or green (*a*) and chromium (*b*)	£2 4 6 (*a*) £2 10 0 (*b*)	£0 9 8 (*a*) £0 10 10 (*b*)
	"Senior" PA/75	Automatic	4½ lb	750 W	Pilot light, thermostatic control	Coloured porcelain body	£2 5 0	£0 9 9
	"Senior" PU/75	Automatic	4½ lb	750 W	Pilot light, thermostatic control, a.c./d.c.	Coloured porcelain body	£2 10 0	£0 10 10
	"Atlantic" LA/75	Automatic	2¾ lb	750 W	Pilot light thermostatic control, reversible flex	Primrose, blue or green (*a*) and chromium (*b*)	£1 19 6 (*a*) £2 5 0 (*b*)	£0 8 7 (*a*) £0 9 9 (*b*)
	"Atlantic" LU/75	Automatic	2¾ lb	750 W	Pilot light, thermostatic control, reversible flex, a.c./d.c.	Primrose, blue or green (*a*) and chromium (*b*)	£2 4 6 (*a*) £2 10 0 (*b*)	£0 9 8 (*a*) £0 10 10 (*b*)
	"Power" AP/10	Automatic	6½ lb	1,000 W	Heavy duty	Chromium	£2 12 6	£0 11 5
	"Power" UP/10	Automatic	6½ lb	1,000 W	Heavy duty a.c./d.c.	Chromium	£2 17 6	£0 12 6
	"Steam-or-Dry" ZA/75	Automatic	3 lb (dry) 3½ lb (filled)	750 W	Pilot light, reversible flex	Chromium	£3 5 0	£0 14 1
	"Steam-or-Dry" ZU/75	Automatic	3 lb (dry) 3½ lb (filled)	750 W	Pilot light, reversible flex, a.c./d.c.	Chromium	£3 10 0	£0 15 2
PIFCO, LTD., Watling Street, Manchester, 4.	1042	Automatic	5 lb	750 W	Streamlined, built-in pilot light	Chromium	£2 4 11	£0 9 10
REVO ELECTRIC CO., LTD., Tipton, Staffs.	"Automatic"	Automatic	4½ lb	650 W	Left and right handed thumb rest, pilot light	Chromium (*a*) or vitreous enamelled colours (*b*)	£2 5 0 (*a*) £2 7 6 (*b*)	£0 9 11 (*a*) £0 10 5 (*b*)
ROBSON ELECTRICAL PRODUCTS, LTD., Ultralite Works, Union Street, West Bromwich.	"Explorer"	Non-Automatic	5 lb	450 W	—	Coloured or nickel plated	£0 19 6	£0 4 5
	"Ultralite"	Non-Automatic	5 lb	450 W	—	Chromium	£1 3 0	£0 5 2
	"Roblec"	Automatic	4½ lb	700 W	—	Coloured or nickel plated	£1 13 9	£0 7 7
	"Roblec"	Automatic	4½ lb	700 W	Pilot light	Chromium	£1 19 6	£0 9 0
	"Roblec Junior"	Travelling	2 lb	200 W	—	Coloured	£0 15 6	£0 3 6
SELEX ELECTRIC CO. (KIRKBY), LTD., Yardley Road, Kirkby Industrial Estate, Liverpool.	"Xcel" A.2004	Non-Automatic	5 lb	450 W	Left or right handed, reversible flex	Chromium	£1 9 6	£0 6 6

Manufacturer	Name or Model	Type	Weight	Loading	Special Features	Finish	Price (Excl. Tax)	Purchase Tax
HENRY SIMS, 191, Goldhurst Terrace, London, N.W.6.	"Simfold" Standard	Travelling	2 lb	300 W	Fold-flat handle	Chromium	£2 1 9	£0 9 2
	"Simfold" Universal	Travelling	2 lb	300 W	Fold-flat handle, 110–250 V range	Chromium	£2 11 9	£0 11 6
	"Mavec"	Non-Automatic	4½ lb	450 W	200/250 or 110/120 V	Cream, blue or light green (*a*) or polished nickel (*b*)	£0 16 8 (*a*) £0 18 0 (*b*)	£0 3 7 (*a*) £0 3 11 (*b*)
TYM'S ELECTRIC, LTD., Systym Works, Kennard Road, Stratford, E.15.	"Golden Arrow"	Automatic	5⅛ lb	750 W	—	Coloured body, chromium sole plate	£1 17 6	£0 8 6
	"Silver Arrow"	Automatic	5⅛ lb	750 W	—	All chromium	£2 1 0	£0 10 0
	"Streamline Safety"	Non-Automatic	4 lb	450 W	—	All chromium	£0 18 6	£0 4 3
J. & H. WALTER, LTD., Garth Road, Morden, Surrey.	"Walter No-Cord"	Automatic	5 lb	900 W	Cordless and complete with ironing table	Cream	£9 17 6	£2 2 3
F. WESTERMAN (WHOLESALE), LTD., 94, Dale End, Birmingham, 4.	"Welec Glide-Eesi"	Non-Automatic	4 lb	450 W	Streamlined	Nickel plated	£0 17 11	£0 4 0



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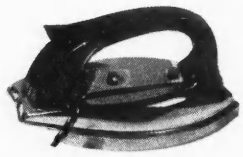

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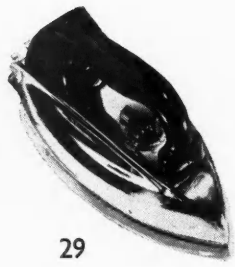

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27. *Henry Sims "Simfold" travelling irons in upright and fold-flat positions*
28. *Westerman "Welec Glide-Eesi" non-automatic iron*
29. *Walter "No-Cord" automatic iron*

CATALOGUES AND LISTS

AIR FILTERS.—Third edition of technical booklet 7106 giving particulars of the company's "Precipitron" electrostatic air filter.—**Sturtevant Engineering Co., Ltd.**, Southern House, Cannon Street, London, E.C.4.

CABLE GLANDS.—Descriptive catalogue (GA/1) dealing with the range of "Telcon" glands for thermoplastic cables.—**Telegraph Construction & Maintenance Co., Ltd.**, Mercury House, Theobald's Road, London, W.C.1.

CABLES.—Catalogue (518) illustrating the use of aluminium for cable sheathing.—**W. T. Henley's Telegraph Works Co., Ltd.**, 51-53, Hatton Garden, London, E.C.1.

CIRCUIT-BREAKERS. — Leaflet giving particulars of the "Lupus" double-pole and triple-pole miniature circuit-breakers.—**M.C.B. Co. (Manchester), Ltd.**, Lupus Works, Oxford Road, Altrincham, Cheshire.

18-page illustrated catalogue dealing with the E-T-A range of miniature circuit-breakers and protection devices distributed by the company.—**Techna (Gt. Britain), Ltd.**, 47, Whitehall, London, S.W.1.

COMBUSTION CONTROL EQUIPMENT.—Illustrated folder (110) describing automatic combustion control equipment and descriptive folder on the No. 160 "Mono" portable CO_2 tester.—**James Gordon & Co., Ltd.**, Dalston Gardens, Stanmore, Middlesex.

ELECTRIC TOOLS.—Descriptive leaflets on the company's comb jointing attachment for use with their home workshop equipment and other similar small saw benches.—**S. N. Bridges & Co., Ltd.**, Bridges Place, Parsons Green Lane, London, S.W.6.

FANS.—Leaflets describing the company's Series 1 and Series 2 rigid p.v.c. centrifugal fans.—**Keith Blackman, Ltd.**, Mill Mead Road, Tottenham, London, N.17.

INSTRUMENTS. — 276-page illustrated catalogue describing the company's range of telecommunication measurement equipment and industrial electronic instruments, complete with a separate price list.—**Marconi Instruments, Ltd.**, St. Albans, Herts.

LIGHTING FITTINGS.—Folder containing a reprint of an article "Lighting in Service Ceilings," together with copies of relevant catalogues of the company's lighting equipment. Three illustrated catalogues and price lists describing industrial, commercial, and shop and display lighting fittings respectively.—**A.E.I. Lamp and Lighting Co., Ltd.**, Crown House, Aldwych, London, W.C.2.

74-page illustrated and priced catalogue (1057) giving particulars of the "Thorlux" range of industrial lighting equipment.—**F. W. Thorpe, Ltd.**, Welby Road, Birmingham, 28.

LIGHTNING PROTECTION. — Broadsheet dealing with the "Omega" lightning protection equipment for power stations and tall chimney shafts.—**W. J. Furse & Co., Ltd.**, Traffic Street, Nottingham.

MEDICAL LAMP.—Illustrated folder describing an infra-red and radiant heat health lamp.—**British Distributing Co., 591, Green** Lanes, London, N.8.

METERS.—Technical brochure of twenty pages (IS.6) dealing with summation metering equipment.—**Ferranti, Ltd.**, Hollinwood, Lancs.

TEST EQUIPMENT.—Broadsheet (FM17) illustrating items in the company's range of high voltage, current injection, and other test equipment.—**Foster Transformers, Ltd.**, South Wimbledon, S.W.19.

WELDING EQUIPMENT.—12-page technical brochure (T.C.103) dealing with manipulative equipment for manual and automatic arc welding.—**Quasi-Arc, Ltd.**, Bilston, Staffs.

WIRING ACCESSORIES. — 32-page illustrated and priced catalogue describing the "Wylex" range of sockets and plugs, cooker control units, switch fuse control units, etc.—**George H. Scholes & Co., Ltd.**, Wylex Works, Wythenshawe, Manchester, 22.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within one month from 30th January:—

LEOPAX. No. 753,641. Class 9. Electrical apparatus and parts, all encased in solid insulating material.—Lion Electronic Developments, Ltd., 12, The Green, Richmond, Surrey.

No. 733,347 (design). Class 9. Electrical contacts and electrical connectors.—U. Tuchel, Neckar, Germany. Address for service, c/o H. A. L. Venner, 1, Great James Street, Bedford Row, London, W.C.1.

PABO. No. B755,106. Class 9. Radio, telephonic, television and telegraphic instruments; sound recording and sound reproducing instruments; electrical and electronic apparatus and instruments, and parts.—Armstrong Wireless & Television Co., Ltd., 25-27, Oxford Street, London, W.1.

PALAMIT. No. 759,193. Class 9. Electrical apparatus and instruments.—Mek-Elek Engineering, Ltd., 17, Western Road, Mitcham, Surrey.

ALL-ELECTRIC CREMATORIUM

A NEW crematorium opened recently at Swansea is said to be the most modern in Britain. It is all-electric, with cremators designed and supplied by the General Electric Co., Ltd.

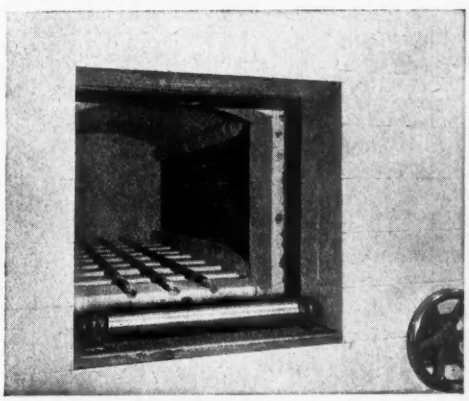
The design of the catafalque is unique. By lowering the roller top the coffin can be passed through to the transfer chamber just below eye level. In the transfer chamber a specially designed hydraulic rubber wheeled combined roller top table is used to elevate the coffin to cremator door level and for transverse movement. Movement of the catafalque is carried out hydraulically. An electric signalling system is used to convey information to the cremator operators.

The furnaces are fully automatic and are provided with temperature controls, indicators and recorders. They can be either push-button operated or time switch controlled. Particular attention has been paid to the thermal insulation. Because of the heavy insulation provided, there is small loss of temperature during the nightly or week-end shut-downs, and consequently no excessive consumption of electricity is required to bring the furnaces back to working temperature. Results with other installations using this type of furnace suggest that with regular use preheating times of 30 minutes will be sufficient.

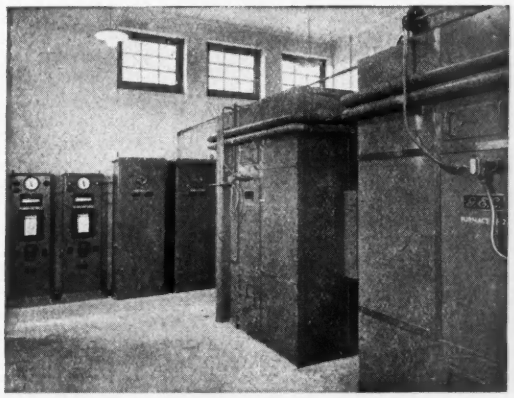
The cremators are of the multi-element type and this has enabled provision to be made for external connection of spare elements without interfering with the operation of the furnaces. The low voltage elements are fed from a double wound step-down transformer rated in accordance with the customary furnace practice and the relatively high ambient temperature existing in a cremator room. They are fitted in separate chambers outside the actual cremating chamber. Each furnace is rated at 60 kW.

The cremating chamber in each furnace has gas-tight walls which ensure adequate protection for the elements and, being of high conductivity material, allow for rapid heating of the cremating chamber by conduction through them. The element chambers are of ingenious design in that they are maintained at a positive pressure and used also for heat recuperation, the recuperated heat serving to preheat the air required for combustion. The heat for this purpose is obtained from the combustion chamber itself. The positive pressure within the element chamber ensures that there is no ingress of corrosive flue gases. The temperatures of the element chambers are automatically controlled and excess temperature protection is provided. To ensure that all products of combustion pass directly to the flue and to suppress leaks to the furnace room, the cremator chamber is tightly sealed and maintained at a negative pressure.

The forced draught cremators are each equipped with a 7·5 h.p. exhaust fan. Fresh air is supplied by separate fans. On all air lines dampers are provided while the exhaust fan has a speed controller so that it is possible under all conditions to adjust the rate of supply of fresh air and the rate of exhaust.



The chamber of one of the G.E.C. electric cremators showing the coffin bars supported on bearers. The hearth below is of solid fire-brick. The elements are mounted behind the chamber walls



General view of the cremator room showing the two cremators on the right, the control panels and contactor cubicles on the left

The cremators are designed to handle six cremations per day and are of standard G.E.C. design. Experience with other furnaces of this design suggests that with regular usage a consumption of approximately 20 kWh per cremation can be expected.

For this installation, Hoare, Lea & Partners, of Clifton, Bristol, acted as consulting engineers. The crematorium building was designed by H. Holmwood Gratix, of Swansea, and erected by the Central Works Department of the Swansea Corporation.

Higher Technological Education

THE London and Home Counties Regional Advisory Council for Higher Technological Education has issued its annual report for 1955-56. This states that the Advisory Committee on Electrical Engineering has given much time during the year to the task of assessing the need in the Region for sandwich diploma courses in electrical engineering. It has recommended the Council to support courses at eight centres. A number of other proposals are under consideration. The Committee states that the new regulations of the Institution of Electrical Engineers will eventually lead to a demand in technical colleges for part-time classes in a wider range of subjects in advance of the Higher National Certificate. In order to give local education authorities some idea of the number of centres required for these advanced courses —mainly for subjects included in Part III of the Institution's examination—the Committee has made an approximate estimate of the number of enrolments likely in the Region in the next three years. The Council has accepted its conclusion that for 1956-57 one centre will meet the need for part-time classes and has recommended the Borough Polytechnic for this purpose. After that year other centres will be needed. In 1957-58, in the opinion of the Committee, a maximum of sixty enrolments is expected, and in 1958-59 a maximum of 100.

Public Transport Conference

THIS year's conference of the Public Transport Association (Brettenham House, Lancaster Place, London, W.C.2) is being held at Eastbourne from 30th April to 2nd May. Papers will be presented on advertising and selling road passenger transport and on stores control and accounting.

GENERATION AND DEVELOPMENT

Recent C.E.A. Contracts

Contracts have been placed by the Central Electricity Authority during the past month for power stations, transforming stations and transmission lines amounting in the aggregate to £7,075,900. They include the following:—

Northfleet power station: Structural steelwork.—Redpath Brown & Co.

High Marnham: Three natural draught reinforced concrete cooling towers.—Mitchell Construction Co.

Meaford: Completion of civil works.—G. Percy Trentham.

Uskmouth: 132 kV switchgear.—Metropolitan-Vickers Electrical Co.

North Tees: Four 30 MVA, 66/11·5 kV transformers.—Yorkshire Electric Transformer Co.

Ince: 132 kV switchgear.—English Electric Co.

Fleet 275/132 kV substation: Site and foundations.—J. L. Eve Construction Co.

Bournville substation: 132 kV switchgear.—A. Reyrolle & Co.

Harker 275/132 kV substation: Site and foundations.—John Laing & Sons.

Elland substation: 132 kV switchgear.—English Electric Co.

Barrow Main substation: Two 30 MVA, 132/33 kV transformers.—Johnson & Phillips.

Summer Lane substation: Two 30 MVA, 132/11 kV transformers.—Crompton Parkinson.

Connah's Quay-Capenhurst: 132 kV overhead line.—W. T. Henley's Telegraph Works Co.

Harker-Spadeadam: 132 kV overhead line.—British Insulated Callender's Construction Co.

Sundon-Aylesbury: 132 kV overhead line.—British Insulated Callender's Construction Co.

East Yelland-Fraddon: Stringing second circuit of 132 kV overhead line.—Pirelli-General Cable Works.

Silsden-Thornhill (part) and Silsden-Keighley/Bradford: 132 kV overhead line.—Pirelli-General Cable Works.

Rayleigh-Southend: 132 kV overhead line.—W. T. Henley's Telegraph Works Co.

Change-Over in Mid-Sussex

Details of the progress made in changing over from d.c. to a.c. in the Mid-Sussex Sub-Area of the South Eastern Electricity Board were given recently by Mr. H. Pryce-Jones, the Sub-Area manager. He said that in the last three years the number of d.c. consumers in the Brighton and Hove District had been reduced from 21,218 to 17,900; in Worthing from 4,814 to 3,000; in Lewes from 1,251 to 520; and in Horsham from 344 to 80. The Brighton and Hove change-over was estimated to cost nearly £1 million when it was undertaken in April, 1954.

Transformer for Hereford

The accompanying picture shows a 30,000 kVA transformer, made by the Brush Electrical Engineering Co., Ltd., for the Midlands Electricity Board, on the last stage of its journey to the Board's Hereford North distribution substation at Holmer, the capacity of which is being increased by the installation of two of these transformers. The load was 120ft long and had an all-up weight of about 100 tons, the transformer itself weighing 73 tons. By the direct route the journey is 130 miles, but in order to avoid low and weak bridges, narrow roads and sharp bends, the load was transported via Birmingham, Worcester, Gloucester and Ross-on-Wye, covering about 185 miles. In order to conform with bridge weight limits, the transformer was drained of 3,500 gallons of oil and refilled with 47,000 cu ft of nitrogen, reducing the weight by about 10 tons. Delivery of the second transformer is expected towards the end of February and both are due to go into commission in April. Although the Hereford North substation was established as recently as 1953, with two 10,000 kVA transformers, the threefold increase in its capacity is necessary to meet new industrial load and the increasing needs of other local consumers, including many connected in the course of the M.E.B. rural development programme.

A Brush 30,000 kVA transformer for the Hereford North substation of the Midlands Electricity Board, crossing the Wye Bridge at Hereford

Holy Island Supply

A decision is still awaited on the use of either underground or overhead cables for the supply of electricity to Holy Island, off the Northumberland coast. An inquiry was held into the scheme by the Ministry of Fuel and Power last year, but the Ministry has not yet announced its decision. The North Eastern Electricity Board intended to use a submarine cable to carry electricity to the island from the mainland but proposed using overhead lines on the island itself. This plan brought opposition from several sources, but was not opposed by the islanders.

Nuclear Power in Wales

A deputation representing Welsh Labour M.P.s met the deputy chairmen (Sir Henry Self and Mr. J. Eccles) and officers of the Central Electricity Authority in London last week to urge the Authority to consider the claims of Wales in planning the further execution of the nuclear power station programme. A full discussion took place and the deputation was given to understand that there were good prospects that Welsh claims would be satisfied in the extensive programme which was expected to be announced shortly by the Minister of Power.

Mr. Cledwyn Hughes, M.P., who led the deputation, said afterwards that the meeting was very satisfactory, but he felt himself unable to comment further pending the Minister's statement.

Later the C.E.A. representatives met Mr. Roderic Bowen, Q.C., M.P. (Cardiganshire), accompanied by members of Cardiganshire County Council, who made representations concerning the particular availability of nuclear power station sites in that county. It was stated that the Authority would certainly include the coastal strip of the county in the survey that would necessarily precede the final choice of any sites in Wales and that they would continue to maintain close contact with the County Council in the investigations that were proceeding.

Inquiry into Scottish Project

A public inquiry opened last week at Largs into the South of Scotland Electricity Board's proposal to build a nuclear power station at Hunterston, Ayrshire. There were 33 objectors.

Mr. A. Thomson, Q.C., said the Board could not accept the view that the disadvantages of taking about 50 acres of arable land outweighed the various advantages which Hunterston had over other possible sites. It was intended that the station should "tie in" with its natural surroundings. So far as was known to science, there would be no detrimental effect from radiation.

Mr. J. S. Pickles, chairman of the

Board, gave an undertaking that the scheme would be submitted to the Royal Fine Art Commission but, when pressed by Mr. C. H. Johnston, representing one group of objectors, said he could not undertake that the Board would abandon the site if the Commission advised that the station could not be built suitably without destroying the beauty of the coast. It would be difficult to get the station into a smaller area of land than that proposed—they were beginning to think that what they had asked for was barely sufficient. He was not prepared to say that there would be no extension of the station.

On the project generally, Mr. Pickles said that it would keep Scotland in the forefront of nuclear power development. The station would generate electricity at a running cost about half that of a coal-fired station.

On Thursday, the third day of the inquiry, Mr. Pickles was questioned about the tenders for the scheme. He said there was a variation in the outputs of the stations in the four tenders and a number of calculations were made to reduce the whole output to cost per kW. The Board did not have the comparable costs of other sites when they considered the tenders, but they had reports from their technical officers on the suitability of various sites.

Replying to Mr. A. Thomson, Q.C., on the fourth day of the hearing, Mr. John Henderson, chief engineer of the Board, said the proposed station would come into operation in the years 1961-62. Because cooling water was required at the rate of 18 million gallons an hour the station had to be at the coast. The west coast, being nearer the centre of the load, was preferable to the east coast. Mr. Henderson, who said he was a member of the Reactor Location Panel, stated that six possible sites had been submitted to the panel. It had finally been decided that the best site between Greenock and Ballantrae was at Hunterston. The saving in building the station at Hunterston instead of farther south would be about £1,650,000. Mr. Henderson added that he could not visualise any site on the Firth of Clyde where the Board would not be opposed.

The inquiry is still proceeding.

OVERSEAS

Nigerian Corporation's Finances

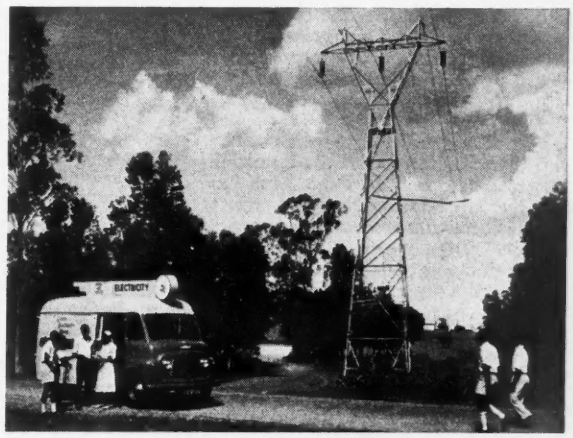
Dr. Eni Njoki, who has recently been appointed chairman of the Electricity Corporation of Nigeria, held a Press conference on 24th January at which he outlined the measures being taken to place the Corporation on a sound commercial footing. He said that the conduct of the Corporation's affairs had been the subject of criticism but it was not his purpose to make excuses or apportion blame. The Corporation had unfortunately incurred deficits, that of £405,000 in the 1955-56 accounts being the largest in its history. The measures being taken included a tariff increase; closer control of expenditure with a revision of budget procedure; the setting up of a new commercial department and one to deal with staff relations, training, etc.; and elimination of all redundant staff. There were already hopeful signs. For example, the accounts for the half-year to 30th September last showed that for the first time the Corporation was operating without loss and, despite further increases in costs, there were good prospects that the current financial year would close without a deficit.

Turning to the future programme, he said that the electricity demand in Nigeria had doubled approximately every three years—an extraordinarily high rate of development. In the period 1951-56 the Corporation had invested £12,250,000 in new plant and a further £9,000,000 was to be invested in 1956-61. The programme included a 10 MW steam station at Aba which would be interconnected with Port Harcourt by a 66 kV line; a 30 MW extension at Ijora "B"; a 132 kV line from Lagos to Ibadan with a spur to Ijebu-Ode and surrounding towns; and further plant additions at Kano "B" and Oji River, together with some 20 diesel sets at smaller undertakings. The Corporation was also carrying out a study of the hydro-electric potentialities of the Shiriro Gorge near Minna and a scheme for a hydro-electric station on the Ombe River was being investigated.

Mobile Electrical Shops in Uganda

Electricity supplies are being extended rapidly by the Uganda Electricity Board in country areas and the Board has, therefore, designed and equipped two vans in order to provide the country consumer with facilities now available to the town dweller. Stocks of the most modern electrical appliances are carried in these vans and displayed, clearly marked with prices, in the rear section. Small appliances, such as electric irons, kettles, boiling rings and lamps, can be purchased on the spot, and orders can be placed for larger articles, such as cookers, water heaters and refrigerators, which will not normally be carried in the vans. Demonstrations of the use of electrical appliances will also be given from time to time. The front section of each van is fitted out as a small office, where electricity accounts may be paid. Trial runs have been made with the vans and a regular service starts this month.

The Board is also arranging to show and sell electrical appliances in the main centres at Kampala, Jinja, Mbale, Masaka, Entebbe, Tororo and Soroti.



One of two vans equipped as shops and offices which serve the country districts of Uganda

Large Kaplan Turbines for Swedish Plant

The Swedish State Power Board has recently placed an order for two Kaplan turbines. They will be the most powerful of their kind in the country. The turbines are to be installed in the Porsi power station on the Lule river in North Sweden. The net head will vary between 33 and 36 metres and the maximum output of each turbine will be 131,000 h.p. at 115 r.p.m. The annual production will amount to 960 million kWh.

Southern Queensland Power Plans

In its report for 1955-56 the Southern Electric Authority of Queensland says that studies are being carried out to determine future policy on power plant installations from 1962 onwards. The Authority has two main power stations, Bulimba "A" and "B," and its system is interconnected with that of the Brisbane City Council. Further development of the 110 kV transmission system is planned and the use of steel-cored aluminium conductors in place of copper has been extended.

Sales of electricity by the Authority last year totalled 493·6 million kWh, an increase of 8 per cent, the average price received per kWh sold falling from 2·62d to 2·58d. Expenditure exceeded revenue by £112,060 and it was necessary to increase tariffs by approximately 10 per cent. A series of overtime bans, followed by a strike by several unions, seriously affected the Authority's operations in the early part of 1956.

Financial Section

STOCKS and SHARES

THIS month sees the start of the main season of company dividends and annual results, which reaches its climax in April and May. In the electrical market it is given an auspicious opening, as a rule, by Associated Electrical Industries and the English Electric Company, both of which end their financial years with the calendar and normally present their accounts with a promptitude unmatched by many businesses of much smaller size and complexity. Last year the two announcements came out within a few days of each other in the middle of February. Other companies due to publish the results for 1956 this month include Bruce Peebles, Hoover, and Midland Electric Manufacturing. News is expected also from International Combustion, which makes up its accounts to the end of September and is now associated with Crompton Parkinson in the atomic power field.

Brush Group

The Brush Group is generally among the earliest companies to announce its annual results. A year ago the company declared a final dividend making a total of 10 per cent for 1955, but decided last November, when the interim dividend for 1956 was due to be declared, to postpone consideration of a distribution until the results for the full year were available. Shareholders were advised that turnover of the group in the first half had been larger than in the corresponding period of the previous year, but that the rising cost of production had narrowed profit margins. At that time, which was in any case a period of general market depression, the 5s shares were quoted down to about 4s 6d, and were still around that mark a month ago. With the approach of the dividend declaration, the shares have staged a good recovery to about 6s.

Mixed Movements

Gilt-edged securities have remained very firm in anticipation of a reduction sooner or later, in the Bank Rate, but the industrial market paused for a breather after the energetic advances of previous weeks. Shares in the main atomic power groups tended to recede a little from their best prices, A.E.I. being half-a-crown down on the week at 66s 3d. Good features nevertheless remained fairly plentiful. Westinghouse Brake were still notably in favour, rising another 3s 9d to £4. British Tabulating at 48s 6d and Holophane at 26s 3d added to previous gains, and Telegraph Condensers were 3s 9d to the good at 37s 6d. Enfield Cables jumped from 14s to 20s on rumours of an offer for the shares. They relapsed to 15s after the company had denied awareness of such a proposal, but later returned to 18s 9d. General Cable rose to 13s 3d, after publication of the annual report, and Cable & Wireless (Holdings) moved up to 11s 3d; the company is maintaining the dividend for 1956 at a total of 10 per cent, as before, and reports an expan-

Price Changes in

Company or Board	Nom. Value	Middle price 4th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1956 Highest	1956 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	79½		3	3	3 15 6	80½	72½
Brit. Elec. 1974/77	100	77½		3	3	3 17 6	79⅛	71½
Brit. Elec. 1976/79	100	81½		3½	3½	4 6 0	84	74½
Brit. Elec. 1974/79	100	92½		4½	4½	4 12 0	95	85½
Overseas Electric Supply								
Calcutta Elec.	£1	19/-		6†	6†	6 6 3†	20/9	18/6
East African Power	£1	20/6		7	7	6 16 6	21/3	19/-
Nigerian Elec.	£1	17/6		10	10*	11 8 6	21/-	17/-
Perak Hydro-Elec.	£1	14/3		10	10*	14 0 9	17/6	14/-
Equipment and Manufacturing								
Aberdare Cables	5/-	10/6		17½	17½	8 6 9	13/6	9/9
Aerialite	1/-	6/-	+3d	45	48	8 0 0	6/9	4/9
Allen, W. H.	£1	38/-	—3d	20	10*	5 5 3	39/-	33/6
Aron Elec. Ord.	£1	52/6		15	15	5 14 3	56/-	52/6
Assd. Automation	10/-	20/3	—3d	10	5	2 9 6	19/-	15/-
Assoc. Elec. Ord.	£1	66/3	—2/6	14	15	4 10 6	85/6	57/6
Automatic Tel. & El.	£1	57/6		15	15	5 4 3	72/6	50/-
Babcock & Wilcox	£1	79/9	—1/-	15	15	3 15 3	85/6	64/-
Baldwin, H. J.	2/-	4/6	—6d	20	20	8 17 9	5/-	3/9
Bakelite	10/-	22/-		16	16	7 5 6	34/-	21/3
Berry's Electric	5/-	5/9		—	10‡	8 14 0	6/6	5/9
British Aluminium	£1	65/-	—1/3	12	12	3 13 9	78/9	40/6
B.I. Callender's	£1	49/3	—2/-	10	12½	5 1 6	54/3	45/-
B.I. Callender's 6% Pref.	£1	21/3		6	6	5 13 0	22/6	20/3
British Tabulating	£1	48/6	+2/9	9	9	3 14 3	51/3	37/3
British Thermostat	5/-	26/3		20	25	4 15 3	31/9	24/6
British Vac. Cleaner	5/-	7/3	—9d	30	15*	10 6 9	8/9	6/-
Brook Motors	10/-	32/6		25	25	7 13 9	44/-	30/-
Brush Group	5/-	6/-		10	10	8 6 9	7/9	4/6
Bulgin, A. F.	1/-	5/6		45	50	—	5/3	4/-
Burco Dean	5/-	9/3	+3d	22½	20	10 16 3	13/6	8/3
Chloride El. Storage "A"	£1	65/9	+9d	17½	17½	5 6 6	73/6	55/-
Clarke Chapman	£1	135/-		20	22½	3 6 9	127/6	89/6
Cole, E. K.	5/-	19/-		17½	17½	4 12 0	22/3	15/-
Cossor, A. C.	5/-	6/9	—3d	15	Nil	Nil	10/3	5/-
Crabtree	10/-	24/6		20	20	8 3 3	29/3	23/-
Crompton Parkinson Ord.	5/-	16/3	—1/3	16	16	4 18 6	15/-	12/3
De La Rue	5/-	19/3	+9d	30	30	7 15 9	20/3	15/-
Decca "A"	4/-	30/9	+9d	56¼	43¾*	5 13 9	44/9	23/3
Desoutter	5/-	28/-		25	30	5 7 3	32/9	25/9
Dewhurst	2/-	7/3		30	16¼*	4 9 9	7/6	5/3
Dictograph Tel.	2/-	7/3		20	20	5 10 3	7/3	5/6
Dubilier Condenser	1/-	5/9		25	30	5 4 3	5/9	3/6
Duport	5/-	19/3	+6d	23	25	6 9 9	21/6	13/9
E.M.I.	10/-	27/9	+6d	15	15	5 8 0	37/-	22/6
Electrical Components	5/-	7/3		25	25	8 12 6*	8/-	6/3
Elec. Construction	£1	25/-		8½	8½	6 16 0	29/9	22/6
Elliott Bros.	5/-	27/6	—1/3	17½	20‡	3 12 9	36/9	22/6
Enfield Cable Ord.	£1	18/9	+4/9	Nil	Nil	Nil	19/3	13/-
English Electric	£1	52/6		12½	12½	4 15 3	66/3	43/9
English Electric 3¾% Pref.	£1	13/6		3¾	3¾	5 11 0	14/6	12/6
Ericsson Tel.	5/-	39/-	+6d	20†	20†	2 11 3†	42/9	31/-
Ever Ready	5/-	31/-		35	35	5 13 0	32/9	24/-
Falk Stadelmann	£1	37/6	+9d	17½	17½	9 6 9	45/9	35/6
G.E.C. Ord.	£1	55/-	—1/3	12½	14	5 1 9	65/6	41/3
G.E.C. 6½% Pref.	£1	23/-		6½	6½	5 13 0	23/9	21/3
General Cables	5/-	13/3	+6d	30	30	11 6 3	13/9	11/3
Greenwood & Batley	£1	46/3		17½	17½	7 11 3	47/6	45/-
Hackbridge Holdings	5/-	20/3	—6d	25	30	7 8 3	24/6	18/9
Hackbridge & Hewittic	5/-	15/-		30	23*	7 13 3	22/-	13/9
Heatrae	2/-	4/-		15	15	7 10 0	5/1	3/9
Henley's	10/-	16/-	—6d	10½	11½	7 3 9	19/9	14/-
Holophane	5/-	26/3	+1/9	30	30	5 14 3	21/6	17/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

sion of about 8 per cent in net earnings at £620,000 after tax.

Telephone Issue

New 5s ordinary shares issued by Telephone Rentals are available in the market at a premium of about 3s 3d. on the price of 7s 6d at which they are offered to the company's stockholders. Payment of the full amount is due by next Wednesday, the 13th. In view of the size of the premium, stockholders will note that this will also be the last day on which they may apply for shares in excess of their allotments. Regarding dividend prospects, the company has stated that in the light of current trading there is every expectation of the dividend being maintained, on the increased capital, at the annual rate of 12½ per cent paid last year. On that basis the yield on the new shares at an all-in price of 10s 9d is a fraction over 5¾ per cent. They will be transferable free of stamp duty until the early part of March.

Electrical Investments

Company or Board	Nom. Value	Middle price 4th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1956 Highest	1956 Lowest
Equipment and Manufacturing—continued								
Hoover	5/-	29/3	—6d	70	50	8 11 0	39/3	23/-
I.C.I.	£1	42/-	—1/3	10	10	4 15 3	49/9	37/3
Intl. Combustion	5/-	22/3		25	20*	4 10 0	25/-	15/3
Johnson & Phillips	£1	32/-	—1/3	15	15	9 7 6	46/6	27/6
Lancashire Dynamo	£1	43/9		15	11*	5 0 6	49/9	37/6
Laurence, Scott	5/-	16/3		12½	15	4 12 3	16/9	13/3
Lister, R. A.	£1	30/-	+1/9	9·3	10	6 13 3	35/3	24/6
London Elec. Wire	£1	46/9	+1/-	12½	12½	5 7 0	52/9	42/6
Lucas, J.	£1	32/6		7½	7½	4 12 3	40/3	28/9
Marryat & Scott	2/-	8/3		30	30	7 5 6	11/3	8/9
Mather & Platt	£1	55/-		15	15	5 9 0	65/3	50/-
Metal Industries	£1	24/6	+1/6	9	9	—	27/-	16/3
Midland Elec. Mfg.	£1	46/3		10	12½	5 8 0	48/6	43/6
Morphy-Richards	4/-	12/-		50	50	—	13/9	10/-
Murex	£1	70/9		20	20	5 13 0	74/6	60/-
Newman Ind.	2/-	2/6		10	10	8 0 0	2/9	2/1
Oldham & Son	1/-	2/6		20	17½*	7 0 0	3/-	2/3
Parnall (Yate)	5/-	7/6	+6d	14	12	8 0 0	9/6	5/6
Parsons, C. A.	£1	56/3		10	10	—	—	—
Plessey	10/-	70/6	+1/-	27½	30	4 5 0	87/6	56/-
Pye "A" Deferred	5/-	16/3		12½	12½	3 17 0	21/3	13/3
Reyrolle	£1	97/6	—2/6	15	16½	3 6 9	117/6	81/-
Rheostatic	4/-	9/-		18½	12‡	5 6 9	—	8/3
Richardsons Westgarth	5/-	18/-		16⅔	16⅔	4 12 6	17/3	13/9
Scottish Cables	4/-	18/3	+1/-	27½	27½	6 0 6	17/9	14/9
Smith (England), S.	4/-	14/-		17½	17½	5 0 0	14/3	10/6
Southern Areas	£1	17/6	—1/3	10	7½	8 11 6	28/9	13/9
Strand Elec.	5/-	8/3		15	15	9 1 9	8/6	6/9
Sturtevant	5/-	25/-		14·4†	15†	3 0 0†	31/3	21/3
Sun Elec.	£1	43/9	+1/3	20	25	11 8 6	42/6	33/9
Switchgear & Cowans	5/-	15/3	—3d	20	25	8 4 0	17/-	12/9
Taylor Tunnicliff	5/-	13/3		15	15	5 13 3	14/-	11/3
T.C.C.	10/-	37/6	+3/9	25	25	6 13 3	45/-	33/9
T.C. & M.	£1	29/6	+6d	8½	8½	5 15 3	34/-	24/-
Telephone Mfg.	5/-	6/6		10	10*	7 13 9	8/6	6/-
Thorn Elec.	5/-	18/9		15	15	4 0 0	22/6	15/-
Thornycroft	£1	33/9		15	12½	7 8 3	49/9	33/6
Tube Investments	£1	61/3		22½	15*‡	4 18 0	70/6	50/9
Vactric	5/-	15/-	+6d	15	17½*	5 16 9	15/-	11/-
Veritys	5/-	9/3		12½	12½	6 15 3	10/-	6/9
Walsall Conduits	4/-	12/3		70	20*	6 10 6	13/6	10/9
Ward & Goldstone	5/-	40/-	+1/3	30	35	4 7 6	39/6	29/-
Watford	2/-	6/6		25	25	7 13 9	7/6	5/6
Westinghouse	£1	80/-	+3/9	18	18	4 10 0	100/-	67/6
West, Allen	5/-	14/-	+6d	15	15	5 7 3	14/6	11/3
Wolf Electric	5/-	17/6		20	20	5 14 3	26/3	17/6
Trusts, Transport and Communications								
Anglo-Portuguese	£1	23/3	+6d	8	8	6 17 9	23/6	20/3
Brit. Elec. Traction: Def. Ord. "A"	5/-	20/-		22½	22½	5 12 6	20/-	15/6
Cable & Wireless: Ord.	5/-	11/3	+3d	10	10	4 9 0	11/3	9/3
4% Loan	100	91	—½	4	4	4 8 0	92½	88
Calcutta Trams	£1	25/9	+9d	7½†	8½†	6 12 0†	27/6	23/-
Cape Elec. Trams	£1	15/-		8	8	10 13 3	20/3	15/6
Marconi Marine	£1	33/-		10	10	6 1 3	34/-	31/-
Oriental Tel. Ord.	1/-	72/6	+2/6	16	—	—	90/-	66/3
Telephone Rentals	5/-	10/9	—6d	12½	12½	5 16 3	11/9	9/6

Radio Shares

A marked improvement during last month in the value of shares connected with radio and television was put down in part to tentative hopes of a coming relaxation in the hire-purchase regulations, as well as to a revival of interest in the future of electronics in industrial fields. It was assisted more recently by reports of a big rise in the retail sales of television sets in the last quarter of 1956, bringing the total sold in the year to a record figure approaching 1½ million sets. Production by the manufacturers is estimated to have been substantially lower than in 1955, but the net outcome is assumed to have produced a reduction of stocks to normal proportions. Among the shares directly or indirectly concerned, Ekco have improved since the beginning of the year from about 16s 6d to 19s, Cossor from 6s to 6s 9d, Decca "A" from 28s 9d to 30s 9d (with the final dividend imminent) and Plessey from 61s to 70s 6d. Pye "A" shares have been well maintained at 16s 3d, while E.M.I. have risen from 24s to 27s 9d.

Electric Fires

Seasonable interest in investments connected with domestic heating appliances discloses a difficulty through the fact that, for many of the companies who make electric fires and whose shares are quoted in the Stock Exchange, this represents only one of many sides of the business concerned. Firms such as G.E.C., E.M.I., E. K. Cole, Falk Stadelmann, Morphy-Richards and A.E.I. are cases in point. An opportunity for acquiring a more concentrated interest in this particular field was initiated with the market introduction, in March of last year, of the 5s shares of Berry's Electric Magicoal. This company has paid an interim dividend of 4 per cent for the year which ends next month. At the time of the marketing of the shares the prospectus envisaged a total distribution of 10 per cent for the current year, given the fulfilment of profit estimates. At the annual meeting held in August the chairman reported that sales in the opening months of this period had been very satisfactory. For much of last winter the company was unable to meet the demand for the fires and steps were taken to enlarge production capacity. The 5s shares have been quoted lately at about 5s 9d. At this level they offer a yield of nearly 8¾ per cent on the indicated rate of dividend.

REPORTS and DIVIDENDS

Cable & Wireless (Holdings), Ltd.—The group earnings for the year ended 31st December last amount to £1,093,000, as compared with £1,037,832 for the preceding year. After providing £473,000 for taxation, the net profits are £620,000 (against £575,442). It is proposed to pay a final dividend of 2½ per cent, which with the three interim dividends makes 10 per cent for the year on capital increased from £5,500,000 to £6,050,000 by a "rights" issue. The distribution on the smaller capital for 1955 was also 10 per cent.

The Pulsometer Engineering Co., Ltd.—Philip Hill, Higginson & Co., announce that they have acquired the Camp Bird group's interest in the Pulsometer Engineering Co., and, as a result, Mr. J. Dalgleish, chairman of Camp Bird, has resigned from the board of the Pulsometer Co.

Enfield Cables, Ltd.—Rumours have been circulating that an offer has been made for the ordinary stock of Enfield Cables, Ltd. The directors state that they have received no such offer and are unaware that one is in contemplation.

New Companies

Elvar Research Laboratories, Ltd.—Registered 18th January. Capital £10,000. To engage in research in the discovery or invention of materials, methods and processes applicable to the manufacture of electronic, radio and television equipment, to engage in research, development and production of germanium, silicon and powdered silver and any other product and material, etc. Directors: J. Z. Lang and G. J. Strowger. Regd. office: Stafford House, Norfolk Street, W.C.2.

Tyrer (Engineering Projects), Ltd.—Registered 18th January. Capital £100. Mechanical and electrical engineers, etc. Directors: P. G. Tyrer and C. E. Marsh. Solicitor: L. Legg, Brighton.

Phillips Industrials, Ltd.—Registered 18th January. Capital £1,000. Wholesale and retail dealers in electrical plant, machinery, fittings and accessories, radio and television sets, etc. Directors: J. D. Rose and Mrs. Shirley J. Phillips. Regd. office: 61-63, St. Paul's Churchyard, E.C.4.

Lee-Spiller (Electrical), Ltd.—Registered 25th January. Capital £100. Electrical engineers and contractors, electricians, radio engineers, etc. M. Dean is the first director. Regd office: 9, Taylors Lane, N.W.10.

G.P.C. Electronics, Ltd.—Registered 18th January. Capital £100. Mechanical, electrical and electronic, nucleonic and general engineers, etc. Solicitors: Theodore Goddard & Co., 5, New Court, W.C.2.

Industrial & Domestic Lighting & Power Co., Ltd.—Registered 21st January. Capital £500. A. R. Mills is the first director. Regd. office: 4, Hamstead Road, Birmingham.

Packer & Prosser, Ltd.—Registered 18th January. Capital £500. Electrical engineers and general electrical installation contractors, etc. Directors: E. M. Prosser and S. R. Packer. Regd. office: Aston Fields, Bromsgrove, Worcs.

H. Tuhrim and Co., Ltd.—Registered 23rd January. Capital £1,000. To acquire the business of an electrical contractor carried on by H. Tuhrim at Beak Street, W.1, etc. Directors: H. Tuhrim and Bertha Tuhrim. Regd. office: 77, Beak Street, W.1.

N. Robinson (Electrical Contractors), Ltd.—Registered 17th January. Capital £1,000. Directors: N. Robinson and Amy Robinson. Regd. office: 5, Hawthorne Avenue, South Shields, Co. Durham.

Bessbrook Products, Ltd.—Registered in Belfast 11th December. Capital £200,000. Manufacturers of electrical conductors, electric cables and wires, etc. Regd. office: 7, Howard Street, Belfast.

Direct Electrics Supply Co., Ltd.—Registered 14th January. Capital £100. Directors: C. B. Law and Mrs. Valerie E. Law. Regd. office: 24, Chancery Lane, W.C.2.

Sparpoint, Ltd.—Registered 24th January. Capital £100. Electronic and automation engineers, etc. Regd. office: 156, Strand, W.C.2.

Bankruptcies

S. W. Morley, carrying on business as Morleys, at Bow Street, Rugeley, Staffs, radio and electrical engineer.—Last day for receiving proofs for dividend 15th February. Trustee, Mr. W. H. Meredith, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver.

W. J. Ward, 29, Stanesfield Road, Cambridge, formerly carrying on business at 67, Norfolk Street, Cambridge, under the style of Walter Ward, as an electrical contractor and engineer.—Receiving order made 23rd January on debtor's own petition.

J. R. Short, 23, Primrose Street, South Hylton, near Sunderland, formerly carrying on business at 11, Rutland Avenue, Bishop Auckland, electrical contractor.—Last day for receiving proofs for dividend, 8th February. Trustee, Mr. N. Sadler, Clarendon House, Clayton Street West, Newcastle upon Tyne, 1, Official Receiver.

Liquidation

Alexander Electrical Co., Ltd.—Creditors' voluntary winding-up. Meetings 1st March, at 5, Mansfield Street, London, W.1, to receive an account of the winding up by the liquidator, Mr. F. S. Young.

Transistorised Telephone System

Telephone administrations in many parts of the world have long been faced with the problem of providing an adequate telephone service in rural areas. It often happens that substantial economies can be effected in line investment, and greater use made of existing pole-routes, by employing the facilities afforded by carrier telephone working. The rural carrier system made by Standard Telephones & Cables, Ltd., has been designed with these objectives in view. Up to ten two-way speech circuits may be transmitted over one open-wire pair and, although primarily intended for open-wire working, the system may be applied to telephone cables.

The merits of the system have been recognised by the South African Post Office, which has recently placed a large contract with the company for telecommunications equipment including a number of transistorised rural carrier telephone systems.

The system is of the stackable type. The "go" and "return" channels are normally adjacent in frequency, and circuits may be picked off, singly, or in any number, at convenient points along the route as required. The channel bandwidth is 300 to 3,400 c/s, thus meeting C.C.I.F. recommendations in this respect. By employing a compandor in each channel, the channel filter requirements are simplified and the noise and crosstalk reduced to a reasonable level.

The system can normally be made compatible with existing one, three and twelve channel carrier telephone systems and, by means of a staggered frequency allocation, two rural carrier systems may be operated over parallel pairs of wires. To this end 21 different channel frequencies are made available in the system.

Depending on the line characteristics and the number of channels, good quality operation is possible over fifty miles or more. As no special line transpositions are needed, and the self-contained equipment requires few adjustments, the system also provides a rapid and convenient means of obtaining temporary circuits for special requirements. The equipment can also be used to provide permanent junction circuits between exchanges.

The apparatus for one circuit is in a small packaged unit containing the transmitter and receiver, complete with the carrier supply and pilot control. The basic units installed at each end of the line are identical for each circuit. Apparatus for several circuits terminating at the same point may conveniently be mounted on conventional racks which occupy a very small floor space area. At subscriber points the small circuit unit may be enclosed in a container suitable for local installation. Full use has been made of junction transistors, modern components, and the latest assembly techniques to achieve a circuit unit small in size and requiring the minimum of mounting space. The use of transistors instead of valves has reduced the drain on power supplies, enabling the system to be operated from normal exchange batteries, a big advantage in areas not served by a main electricity supply.

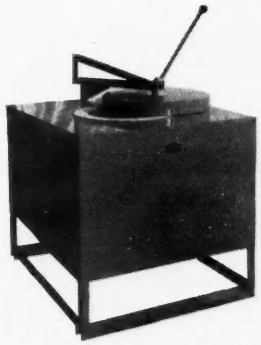
A Belgian Centenary

To celebrate the centenary of its journal *Revue Universe'le des Mines* the Association des Ingénieurs sortis de l'Ecole de Liège (22 Rue Forgier, Liège, Belgium) is organising an international conference on scientific and industrial research in May (6th to 8th). The conference will be arranged in six sections—coal, chemistry, electricity, nuclear energy, civil engineering, and minerals and metals.

NEW ELECTRICAL EQUIPMENT

Electric Furnace

An electric aluminium melting furnace announced by HEDIN, LTD., Commerce Estate, South Woodford, Essex, is supplied in two models, bale-

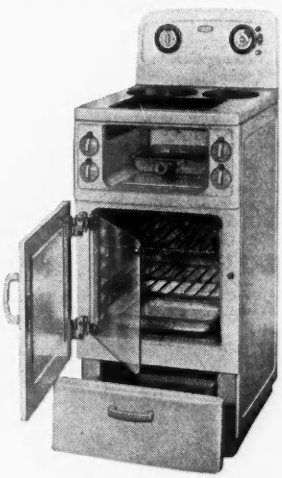


Hedin electric aluminium melting furnace

out and tilting. The thermostatically controlled elements give close control of the heat and it is possible to keep the temperature of the metal consistently just above melting point. This also means that metal losses due to volatility are virtually nil. There is no direct contact between the source of heat and the crucible and the furnace requires little or no maintenance. Construction is robust and simple and the elements, which are arranged for rapid heating, can be replaced quite easily without dismantling the brickwork. The furnace is available with capacities of from 50 to 1,000 lb. Special sizes are also built to order.

Cooker with Glass Inner Door

The "Quality" electric cooker (described in the *Electrical Review* of 23rd March, 1956, p. 451) is now available from the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, with a full-view glass inner door to the oven and, on the plinth models, a roomy storage drawer fitted into the base.



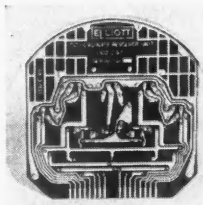
G.E.C. "Quality" cooker with inner glass door and storage drawer, and fitted with an "Auto-timer" panel

Although compactly designed for the smaller kitchen, this cooker has a spacious hob and large thermostatically controlled oven. Simmer control is provided on the 8in boiling plate and (on the three-plate model) three-heat control on the 6¼in plate. The hotplates, three-piece oven interior, lift-off oven door and storage drawer are removable for cleaning without the use of any tools.

The total loading of the three-plate cooker is 7,225 W. Solid boiling plates are fitted as standard, but radiant plates can be supplied. Voltage ranges are 200/210 V, 220 V, 230/240 V, 250 V, a.c. only. The price of the three-plate plinth type cooker with glass door and storage drawer (DC.757GD) is £35; without glass door but with storage drawer (DC.757D) the price is £34 5s.

Printed Circuits in Sub-Miniature Radar Receiver

The compact design of a sub-miniature radar receiver recently introduced by ELLIOTT BROTHERS (LONDON), LTD., Boreham Wood, is due to the fullest use of printed circuit techniques. The receiver comprises six replaceable plug-in units, five of which



Plug-in unit of Elliott sub-miniature radar receiver

are made with all components on one side of a Bakelite copper-clad laminated sheet, the etched circuit, including gold-plated etched plugs, being arranged on the opposite side to allow connections to be made by dip soldering. Where valve wires are to be connected, small eyelets have been inserted into the board so that if a valve change is necessary at a later date no damage can occur to the copper foil due to careless hand soldering.

One of the main features of the receiver is the use of printed circuit sheet connections at the rear of the sockets. This demonstrates that dip soldering or automatic soldering techniques can be as readily applied to these interconnecting points as to the individual replaceable units. In fact, throughout the receiver practically all wired joints have been eliminated.

Commercial Clothes Dryer

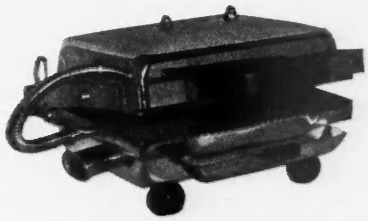
A commercial tumbler dryer with space for an 8-9 lb load has been developed by the ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2. It has a 24in diameter revolving drum and garments are gently tumbled through a constant current of warm air. Evaporation is at a rate of 6-8½ lb of water per hour. The dryer is 36in high by 26½in wide by 26⅛in deep and weighs 168 lb. It is fitted with a continuously-rated drip-proof ⅙ h.p. 3-phase induction motor, with automatically reset overload protector, a 2,000 r.p.m. moulded plastic fan, and a 4 kW low temperature heater. The heater, mounted in the door, is connected to a single-phase supply by a three-pin plug linked with the door handle and instantly disconnects when the door is opened. An automatic thermal cutout is fitted.

The dryer is controlled by an automatic switch set in an electrically operated timer marked from zero up to 90 minutes. The machine is started by moving the pointer from zero to the required drying period, and when the pointer reaches zero the motor, fan and heater are switched off. It is suitable only for connection to a three-phase supply through a 30 A fuse box, and for large-scale drying operations may be installed in groups of three. The cabinet finish is white or cream stoved enamel with grey recessed toe-strip. The price of the machine, Model 4601, is £69.

Infra-Red Grill

The "Grill-Quick" infra-red grill now being marketed by S. I. ENGEL, 23-25, Kensington Park Road, London, W.11, has a grilling surface measuring 7 by 10in, claimed to be large enough to grill three steaks at a time. The elements are of the mica type and the loading is 1,200 W.

The size of the grill is 11in square by 6in deep and the finish is chromium with black insulated feet and handle. It is supplied with a detachable drip tray and the total weight is 18½ lb. The price is £10 10s.



Engel "Grill-Quick" infra-red grill

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 13th February from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1952

23294. Electric & Musical Industries, Ltd.—Electronic storage tubes and circuit arrangements therefor. 3rd September, 1953. (768021.)

28033. Hotpoint Electric Appliance Co., Ltd.—Cut-outs for electrically heated utensils for heating liquid. 9th November, 1953. (767937.)

32285. Standard Telephones & Cables, Ltd.—Railway route-setting apparatus. 19th December, 1952. (767941.)

1953

8976. General Electric Co., Ltd., and James, E. G.—Methods of forming p-n junctions in crystalline semi-conducting materials. 30th September, 1953. (Cognate application 8975, 31st March, 1953.) (Divided out of 723179.) (768022.)

11836. Croydon Engineering Co., Ltd.—Dynamo-electric machines. 19th May, 1954. (768349.)

15354. Sparcatron, Ltd.—Apparatus for cutting or working electrically conductive materials. 27th January, 1955. (768230.)

15467. Holford Processes, Ltd., and Holford, H. J.—Electrical apparatus for separating oil from aqueous liquids. 3rd September, 1954. (767944.)

18497. General Electric Co.—Clothes washing machines. 3rd July, 1953. (768024.)

21956. Electric & Musical Industries, Ltd.—Envelopes for electron discharge devices. 3rd August, 1954. (767948.)

24528. Holophane, Ltd.—Refractors for street lighting purposes. 6th December, 1954. (767952.)

26215. Richardson & Sheeres, Ltd., and Thermega, Ltd.—Construction of electrically heated textiles. 5th August, 1954. (767954.)

28781. Heidecke, R., and Franke, H.—Flash-lamp plug-and-socket connectors. 19th October, 1953. (768352.)

30337. Standard Telephones & Cables, Ltd.—Regulated power supply equipment. 29th October, 1954. (768029.)

31453. Automatic Telephone & Electric Co., Ltd.—Regenerative frequency dividing circuits. 10th November, 1954. (767928.)

35201. General Electric Co.—Control of electric irons. 17th December, 1953. (767929.)

1954

1292. Metropolitan-Vickers Electrical Co., Ltd.—Commodity meters of the recording type. 13th January, 1955. (768357.)

1430. Advance Components, Ltd., and Stachera, H. S.—Voltage stabilisers. 10th January, 1955. (768081.)

2949. Edison Swan Electric Co., Ltd.—Manufacture of electrical socket contacts. 22nd December, 1954. (768242.)

4193. Standard Telephones & Cables, Ltd.—Thermionic vacuum tube holder. 12th February, 1954. (767963.)

7581. Scorah, L. V. D.—Electrically heated distillation stills. 24th February, 1955. (768138.)

8482. Metropolitan-Vickers Electrical Co., Ltd.—Saturable core reactance devices. 23rd March, 1955. (768140.)

11153. Standard Telephones & Cables, Ltd.—Automatic telephone system comprising electronic control equipments. 15th April, 1954. (768093.)

11786. Allied Control Co., Inc.—Electromagnetic relays. 23rd April, 1954. (768141.)

11851. Metropolitan-Vickers Electrical Co., Ltd.—Blading for use in elastic fluid flow apparatus such as turbines. 13th April, 1955. (768026.)

12481. General Electric Co., Ltd., and Martin, J. T.—Electric cable duct or trunking systems. 25th April, 1955. (768254.)

12482. General Electric Co., Ltd.—Electric devices having a cap mounted on a glass neck part of an envelope. 22nd April, 1955. (767971.)

14266. Reyrolle & Co., Ltd., A.—Unit-drive rotary printing press speed control means. 13th May, 1955. (767975.)

16417. Londex, Ltd., and Smith, W. H.—Electromagnetic relays. 1st June, 1955. (768147.)

17451. British Dielectric Research, Ltd.—Manufacture of electric capacitors. 14th June, 1955. (Addition to 686031.) (768366.)

17681. Monroe Calculating Machine Co.—Apparatus for transferring electric data pulse trains between synchronously operating devices. 16th June, 1954. (767981.)

19283. Badische Anilin- & Soda-Fabrik Akt.-Ges.—Plate electrodes. 1st July, 1954. (767984.)

19911. Crompton Parkinson, Ltd.—Supply circuits for electric discharge lamps. 23rd June, 1955. (767987.)

20011. Philips Electrical Industries, Ltd.—Circuits comprising gas discharge tubes. 8th July, 1954. (767988.)

20579. Ottermill Switchgear, Ltd.—Electrical power distribution systems. 4th July, 1955. (768152.)

20959. British General Manufacturing Co. (1941), Ltd.—Socket-outlets for electric plug and socket couplings. 14th July, 1955. (768154.)

21217. Fairbairn Lawson Combe Barbour, Ltd.—Electric stop-motion for textile machines. 16th June, 1955. (767990.)

22310. General Electric Co., Ltd.—Electromagnetic induction apparatus. 20th July, 1955. (768371.)

23496. Carr Fastener Co., Ltd.—Electric lamp sockets. 11th July, 1955. (768159.)

23570. Waring, R. W.—Electrostatic apparatus and method. 13th August, 1954. (768033.)

23933. General Electric Co., Ltd., Jones, D. D., and Missen, J. I.—Semi-conductor devices. 26th July, 1955. (768103.)

24051. General Electric Co.—Semi-conductor P-n junction units. 18th August, 1954. (Addition to 738231.) (768104.)

24298. Philips Electrical Industries, Ltd.—Differential electronic amplifiers. 20th August, 1954. (767997.)

27960. International Business Machines Corporation.—Ferro-electric condenser transfer circuit. 28th September, 1954. (768377.)

28783. Pye, Ltd.—Television pick-up tube. 6th October, 1954. (768108.)

29261. British Thomson-Houston Co., Ltd.—Automatic electric motor control. 11th October, 1955. (768277.)

31764. Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—Omnidirectional radio range system. 3rd November, 1954. (768109.)

32903. Bendix Aviation Corporation.—Synchro null voltage system and method. 12th November, 1954. (768045.) 34684. Electric switching apparatus. 30th November, 1954. (768387.)

34699. General Electric Co.—Control systems for electric power networks. 30th November, 1954. (768047.)

35468. Cinch Manufacturing Corporation.—Electrical contact members for assembly with a holder for a thermionic valve, electrical plug or other electrical device having projecting terminal prongs. 7th December, 1954. (768171.)

35813. Philips Electrical Industries, Ltd.—Cathode-ray tubes employing ion traps. 10th December, 1954. (768175.)

35925. Ferranti, Ltd.—Rotary electric generators. 8th December, 1955. (768048.)

36216. Woods of Colchester, Ltd.—Control of electric motors. 7th November, 1955. (768390.)

1955

985. Metropolitan-Vickers Electrical Co., Ltd.—Multi-break air- or gas-blast circuit interrupters. 12th January, 1955. (768053.)

1097. Chromatic Television Laboratories, Inc.—Grid structures for use in cathode-ray tubes. 13th January, 1955. (768008.)

1118. Deutsche Gold- und Silber-Scheideanstalt Vorm. Roessler.—Electrical resistance thermometer of low heat capacity. 13th January, 1955. (768117.)

1144. Siemens-Schuckertwerke Akt.-Ges.—Apparatus for measuring or producing a response related to the torque in an electrical machine. 13th January, 1955. (768296.)

1549. Compagnie Générale de Télégraphie sans Fil.—Electrical resistors having a highly negative temperature coefficient and process for manufacturing such resistors. 18th January, 1955. (768009.)

1618. Union Carbide & Carbon Corporation.—Air-depolarised electric cells. 19th January, 1955. (768054.)

2520. General Electric Co.—Electrical temperature responsive devices. 27th January, 1955. (768120.)

4519. General Electric Co.—Air distributing devices. 15th February, 1955. (768300.)

5595. McGraw Electric Co.—Fuse cut-outs. 24th February, 1955. (768186.)

5915. Soc. Erec Soc. d'Etudes, de Realisations et d'Exploitations Commerciales.—Electric batteries. 28th February, 1955. (768188.)

7820. Westinghouse Electric International Co.—Steam turbines. 17th March, 1955. (768069.)

8562. Babcock & Wilcox, Ltd.—Forced flow once through tubulous vapour generating and superheating units and the starting of turbines arranged to be supplied with vapour from such units. 24th March, 1955. (768201.)

8752. Atomic Energy of Canada, Ltd.—Fuel rod assemblies for nuclear reactors. 25th March, 1955. (768078.)

9560. Western Electric Co., Inc.—Electric welding systems. 1st April, 1955. (768406.)

9874. Wingrove & Rogers, Ltd.—Variable electric capacitors. 5th April, 1955. (768410.)

9955. General Electric Co.—Mounting motor protection devices on electric motors. 5th April, 1955. (768413.)

9963. General Electric Co.—Copper-aluminium tubular connectors. 5th April, 1955. (768211.)

10458. Marconi's Wireless Telegraph Co., Ltd.—Diode switching means. 12th April, 1955. (768215.)

10654. Canadian General Electric Co., Ltd.—Cooling bearings in dynamo-electric machines. 13th April, 1955. (768315.)

10717. Telefunken Ges.—Electric motors. 14th April, 1955. (768415.)

10802. General Electric Co.—Hermetically sealed motor compressor units. 14th April, 1955. (768318.)

11302. General Electric Co.—Air conditioning apparatus. 19th April, 1955. (768427.)

11480. Standard Telephones & Cables, Ltd.—Visual indicators. 21st April, 1955. (768431.)

12137. Ateliers de Constructions Electriques de Charleroi.—Vibrating-blade current generators. 27th April, 1955. (768333.)

12177. General Electric Co.—Measuring, indicating or recording devices. 27th April, 1955. (768222.)

12423. Marconi's Wireless Telegraph Co., Ltd.—Omnidirectional transmitting or receiving aerials. 29th April, 1955. (768338.)

12484. Brinton, R. L.—Separators for electric cables or cores thereof. 29th April, 1955. (768339.)

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 11th February

BIRMINGHAM. — Imperial Hotel, 6 p.m. I.E.E. South Midland Supply & Utilisation Group. "Temperature Rises in Electrical Machines as Related to the Properties of Thermal Networks," by Dr. J. J. Bates and Prof. A. Tustin, "Temperature Rises in Electrical Machines on Variable Load and with Variable Speed," by Prof. A. Tustin and Dr. J. J. Bates, and "Performance and Heating Curves for Motors on Short-Run Duties," by Prof. A. Tustin, D. F. Nettell and R. Solt.

BRISTOL. — Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Centre. "A New Meter for the kVA Demand Charge," by P. Baxter.

DUBLIN.—Gresham Hotel, 8.30 p.m. I.E.E. Irish Branch. Annual dance.

HULL.—Y.E.B., Ferensway, 7 p.m. I.E.S. Leeds Centre. "Glassware for Artificial Lighting," by D. Keenan.

LONDON.—Savoy Place, W.C.2, 6.30 p.m. I.E.E. London Graduate & Student Section. "The Visit of the British Electricity Supply Delegation to the Soviet Union," by J. Eccles.

At the Royal Institution, Albemarle Street, W.1, 6 p.m. Illuminating Engineering Society. Trotter-Paterson lecture, "Some Experiments in the Interference of Waves," by Sir Lawrence Bragg.

White Hall Hotel, Bloomsbury Square, 7.30 p.m. A.S.E.E. Central London Branch. "Light Sources," by G. V. McNeill.

MANCHESTER. — Engineers' Club, Albert Square, 7.30 p.m. Junior Institution of Engineers, North-Western Section. "Argon Arc Welding," by R. Blackburn.

NEWCASTLE-UPON-TYNE. — Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. Supply Section chairman's address, "Engineering Efficiency, Economics and Expediency," by P. J. Ryle.

SHEFFIELD. — The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. Three short papers, by Centre members.

Livesey Clegg House, 7.30 p.m. Junior Institution of Engineers, Sheffield & District Section. "Power Station Construction," by S. S. Ellam.

SOUTHAMPTON. — Guild Hall, 6.30 p.m. I.E.E. Southern Centre. Faraday Lecture, "Nuclear Energy in the Service of Man," by Dr. T. E. Allibone.

STAFFORD. — Technical College, 7 p.m. I.E.E. North Staffordshire Sub-Centre. Chairman's address, by A. T. Chadwick.

WEMBLEY PARK.—Century Hotel, Forty Avenue, 8.15 p.m. A.S.E.E. North West London Branch. "Carbon Brushes: their Application in Electrical Machines," by P. E. Lyddon.

Tuesday, 12th February

BELFAST.—Queen's University, 6.30 p.m. I.E.E. Northern Ireland Centre. Informal evening on "Electronics and Automation," talk by Dr. H. A. Thomas.

BOURNEMOUTH. — Grand Hotel, Firvale Road, 8 p.m. A.S.E.E. Bournemouth Branch. Regional lecture, "Theory of Atomic Energy and Industrial Application," by Dr. J. H. Fremlin.

LEEDS.—1, Whitehall Road, 7 p.m. I.E.E. North Midland Graduate & Student Section. "Current Transformers," by P. Biswas.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Radio Sections. "The Ultimate Performance of the Single-Trace High-Speed Oscillograph," and "The Design and Performance of a New Experimental Single Transient Oscillograph with very high Writing Speed," by M. E. Haine and M. W. Jervis. (Joint meeting.)

Connaught Rooms, Great Queen Street, W.C.2, 12.30 for 1 p.m. Electrical Industries Club. Luncheon. Speaker, Christopher Brasher.

Grosvenor House, Park Lane, W, 6.30 for 7 p.m. Electrical Contractors' Association. Annual dinner.

Bonnington Hotel, Southampton Row, 6.30 p.m. Institute of Electricity Administration. "Electronic Developments in Adding Machines," by G. Butcher.

85, Minories, E.C.3, 5.30 p.m. Institute of Marine Engineers. "Boiler Feed Water Treatment for Advanced Steaming Conditions," by J. Leicester, and "Corrosion in Scotch Marine Boilers," by Dr. F. Wormwell, Dr. G. Butler, J. G. Beynon and H. C. K. Ison.

LOUGHBOROUGH.—The College, 6.30 p.m. I.E.E. East Midland Centre. "Some Applications of Mercury Arc Rectifiers," by A. Wren and "The Transductor as Applied to Distance Protection," by H. Barber.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Utilisation Group. "Electricity in Modern Commercial Horticulture," by C. A. Cameron-Brown and A. W. Gray.

College of Technology, 7.30 p.m. Society of Instrument Technology, Manchester Section. "Computing Technique Applied to Measurement and Control," by J. Wills.

NEWCASTLE-UPON-TYNE. — Old Assembly Rooms. North East Electrical Club. Ladies' night.

RUGBY. — College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. "Brushless Variable-Speed Induction Motors," by Prof. F. C. Williams, E. R. Laithwaite and L. S. Piggott.

TAUNTON.—County Hotel, 6.30 p.m. Institution of Heating & Ventilating Engineers, South Western Branch. "Heating and Hot Water in Flats," by K. W. Dale.

YORK. — Royal Station Hotel, 7.30 p.m. A.S.E.E. York Branch. "Level Control Equipment," by R. H. Stanard.

Wednesday, 13th February

ABERDEEN. — Caledonian Hotel, 7.30 p.m. I.E.E. North Scotland Sub-Centre. "Some Aspects Concerning Fundamental Principles and Applications of Power System Protection," by A. M. Wesley.

BIRMINGHAM.—At the Exchange & Engineering Centre, Stephenson Place, 7.15 p.m. A.S.E.E. Birmingham Branch. "Temperature Measurement," by D. Smith.

BRADFORD. — Midland Hotel, 8 p.m. A.S.E.E. Bradford Branch. "The Cobalt Unit at the Regional Radiotherapy Centre," by A. E. Holland.

GLASGOW.—Burlington House, Bath Street, 7.30 p.m. Institute of Metal Finishing, Scottish Branch. Annual buffet and dance.

HALIFAX.—Crown Hotel, Horton Street, 7.30 p.m. A.S.E.E. Halifax Branch. Discussion and lecturettes by branch members.

LANCASTER. — N.W.E.B. Demonstration Theatre, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. "Germanium and Silicon Power Rectifiers," by T. H. Kinman, G. A. Carrick, R. G. Hibberd and A. J. Blundell.

LONDON.—Central Hall, Westminster, 6 p.m. Institution of Electrical Engineers. Faraday Lecture, "Nuclear Energy in the Service of Man," by Dr. T. E. Allibone.

University College, Gower Street, W.C.1, 7.30 p.m. Radar Association. "Automation —Computer Controlled Machine Tools for Small Quantity Production," by D. T. N. Williamson.

John Adam Street, Adelphi, 2.30 p.m. Royal Society of Arts. "The Development and Use of Glass Fibres," by A. H. Davies.

St. Bride Institute, Bride Lane, E.C.4, 6.30 p.m. Institution of Engineers-in-Charge. "Materials Handling and Stores Control," by A. J. Cross.

Connaught Rooms, Great Queen Street. Institution of Production Engineers, London Section. Annual dinner.

MANCHESTER. — Engineers' Club, Albert Square, 6.45 p.m. I.E.E. North-Western Radio & Telecommunication Group. "Frequency-Modulated Quartz Oscillators for Broadcasting Equipment," by W. S. Mortley.

NORTHAMPTON. — College of Technology, 7.15 p.m. Northampton & District Electrical Association. "Problems Associated with Earth Leakage Protection," by J. A. Robbins.

OXFORD.—37, George Street, 7 p.m. I.E.E. district meeting. "Fuel and the Future," by Dr. J. Wilks.

WOLVERHAMPTON. — Technical College, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midlands Section. "An Automatic System for Electronic Component Assembly," by K. M. McKee.

Thursday, 14th February

BRISTOL.—The University, 7 p.m. I.E.E. Bristol Graduate & Student Section. "Electronic Control of Resistance Welding," by D. J. Matthews.

CARDIFF.—Institute Buildings, Park Place, 6 p.m. South Wales Institute of Engineers. "The Design, Construction and Performance of Approved Type Battery Mining Locomotives and Factors Governing their Selection, depending on the Duties Required," by C. L. Forbes.

DUNDEE.—Queen's College, 7 p.m. I.E.E. North Scotland Sub-Centre. "Some Aspects Concerning Fundamental Principles and Applications of Power System Protection," by A. M. Wesley.

ILMINSTER. — At Standard Telephones & Cables, Ltd., Dowlish Ford Mills, 4 p.m. I.E.E. South-Western Sub-Centre. "The Generation and Synthesis of Music by Electrical Means," by A. Douglas.

LIVERPOOL.—1, Old Hall Street, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "Radioactivity and Methods of Measurement," by E. W. Pulsford.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilisation Section. "Self-Compensated Alternators," by P. J. Bhatt, "The Metal Rectifier and its Importance to the Electrical Engineer," by D. Mangnall, and "The Automatic Factory," by G. F. Stewart.

At the Royal Society of Arts, John Adam Street, W.C.2, 7.15 p.m. British Kinematograph Society. "Photo-Electronic Aids to Photography," by Prof. J. D. McGee.

SWANSEA.—South Wales Electricity Board Showrooms, The Kingsway, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. Informal meeting.

WIMBLEDON.—Prince of Wales Hotel, 7.30 p.m. A.S.E.E. South West London Branch. "Personal Wartime Escape Experiences," by Major Gordon Instone.

Friday, 15th February

IPSWICH. — Great White Horse Hotel. Ipswich & District Electrical Association. Annual dinner.

LONDON. — Church House, Westminster, 6 p.m. Institution of Mechanical Engineers and the British Nuclear Energy Conference. Thomas Hawksley Lecture, "Some Engineering Problems in the Industrial Development of Nuclear Energy," by Sir Claude Gibb.

Connaught Rooms, W.C.2, 12.15 for 1 p.m. Electrical Trades' Commercial Travellers' Association. Luncheon.

Connaught Rooms, Great Queen Street, 7.30 for 8 p.m. Incorporated Plant Engineers. Annual dinner.

SHEFFIELD.—Grand Hotel, 7 for 7.30 p.m. Institute of Metal Finishing, Sheffield & North-East Branch. Dinner and dance.

STONE.—Crown Hotel, 7 for 7.30 p.m. I.E.E. North Staffordshire Sub-Centre. Annual dinner.

Saturday, 16th February

OXFORD.—Regents Park College, Pusey Street, 6.30 p.m. A.S.E.E. Oxford, Reading & Districts Branch. "Fluorescent Circuits and Servicing," by G. V. McNeill.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—Posts and Telegraphs. 12th March. Interference suppression condensers. (E.S.B. 2469/57. Ten/23898.)* 4th April. Pole mounted line filter groups. (E.S.B. 2468/57. Ten/23923.)*

Basingstoke.—Park Prewett Group Hospital Management Committee. 28th February. Electric lamps for Park Prewett Hospital for six months from 1st April next. F. Hales, group secretary, Basingstoke.

Burma.—Union Purchase Board. 13th February. Electrically-driven pumping sets. (E.S.B. 2761/57. Ten/23942.)*

Formosa.—Central Trust of China, Purchasing Department. 3rd March. Telephone switchboard, testing equipment, etc. (E.S.B. 2739/57.I.C.A. Ten/23937.)*

Hemel Hempstead.—Borough Council. 22nd February. Electric lamps and repairs to Venner time switches for the year 1957-58. A. H. Turner, borough engineer, High Street.

India.—General Services Administration, Washington. 14th February. 60 air conditioning units. (E.S.B. 2959/57.I.C.A. Ten/23979.)*

Maesteg.—U.D.C. 23rd February. Electrical fittings for the year ending 31st March, 1958. Lewis W. Jones, surveyor, Council Offices, Maesteg, Glam.

Peterborough.—City Council. 15th February. Electrical installations in 124 houses and 34 bungalows on the Bluebell and Park Lane estates. (See this issue.)

Poole.—Borough Council. 18th February. Electric wiring supplies and accessories, electric lamps, and street lighting lanterns for the year ending 31st March, 1958. Borough engineer, Municipal Buildings.

Rhodesia and Nyasaland.—Director of Medical Services. 15th February. X-ray plant and technical equipment. (E.S.B. 2729/57. Ten/23959.)* 22nd February. X-ray plant and processing equipment. (E.S.B. 2726/7/8/57. Ten/23956/7/8.)*

Federal Power Board. 7th March. Two electric passenger lifts, low-voltage control equipment, and automatic fire fighting equipment for transformer protection at Kariba power station. (See this issue.)

South Africa.—Stores Department, South African Railways. 27th February. U.g.a. cable and copper wire. (E.S.B. 2822/57. Ten/23975.)* 1st March. Batteries for electric locomotives. (E.S.B. 2824/57. Ten/23970.)* 55 electric stoves and 55 water heaters. (E.S.B. 2825/57. Ten/23977.)*

United States.—Bureau of Reclamation. 28th February. Control and distribution boards and battery chargers. (E.S.B. 2532/57. Ten/24003.)* 26th February. 5,000 kVA transformer. (E.S.B. 2533/57. Ten/24006.)*

Witham.—U.D.C. 20th February. Street lighting equipment. (See this issue.)

ORDERS PLACED

Barrow-in-Furness.—Watch Committee. Electrical installation work in the new police headquarters and magistrates' court (£5,795). —North Western Electricity Board.

Birkenhead.—Water Committee. Electrical installation work in connection with River Dee scheme (£7,558).—McGoff & Vickers.

Bradford.—Town Planning and Building Committee. Recommended. Electrical work at 359 dwellings on the Wood Side estate (£16,022).—B. D. C. Morley.

Glasgow.—Municipal Transport Committee. Cables (£6,953).—Scottish Cables.

Norfolk.—County Health Committee. Recommended. Supply and installation of equipment for the radio control of the ambulance service in East and West Norfolk (£4,600).—Hudson Electronic Devices.

County Welfare Committee. Lift at Burnham Westgate Hall (£1,439).—Evans Lifts.

Windsor.—Corporation. Electrical installation work in 40 flats and 18 houses at Clewer New Town (£2,073).—P. G. Steadman.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aylesbury.—Residential development of 15-acre site, Molefield estate; borough engineer, Friarscroft, 3, Oxford Road.

Berwick.—Secondary school; A. Anderson (Contractors), Ltd., Stanmore Road, Newcastle-on-Tyne.

Birkenhead.—Factory, Hilbert Street; B. E. Redfern, architect, 22, Hamilton Square.

R.C. church, Worcester Road; F. X. Velarde, architect, Windsor Buildings, George Street, Liverpool.

Science teaching block, St. Anselm's College; W. & J. B. Ellis, architects, Barclays Bank Buildings, St. Helens.

Birmingham.—Operating theatres at the Birmingham and Midland Hospital for Women, Showell Green Lane (£100,000); Martin & Martin & Ward, architects, 106, Colmore Row, Birmingham, 3.

Brighton.—Factory for Tungsten Manufacturing Co., Ltd., at Lower Bevendean industrial area; town clerk.

Bristol.—Factory, Wilder Street and Dean Street; Henry Simmons, Ltd., 12, St. James Barton.

Castleton (Lancs).—Two-storey offices, Castleton Ironworks; David Bridge & Co., Ltd., rubber machinists, Queensway, Castleton.

Cheltenham.—Housing estate, Rosehill Street; J. A. Pye, Ltd., Copse Lane, Headington, Oxford.

Coulsdon.—County secondary school, Woodcote; Wm. Willett, Ltd., builders, Sloane Square, London, S.W.1.

Coventry.—Factory, Fletchamsted Highway; F. Hocking & Sons, Ltd., Walsgrave Road.

New premises in Tower Street; Binney & Son, Ltd., engineers' furnishers, 120, Queen Victoria Road.

Cumberland.—School at Distington; county architect, Portland Square, Carlisle.

Deal.—Factory, Northwall Road; Kenton Berk, Ltd., shirt manufacturers, 133, Rye Lane, New Cross, London, S.E.15.

Doncaster.—Clay Lane Junior School, Curlew; T. H. Johnson & Son, architects, 20, Priory Place, Doncaster.

Eastbourne.—Conference and concert hall near Winter Gardens (£400,000); Easton & Robertson, architects, 53, Bedford Square, London, W.C.1.

Egham. — Hythe Secondary School (£195,883); Speirs, Ltd., 66, Victoria Street, London, S.W.1.

Ellesmere Port.—Houses (326), North Whitby estate; borough engineer, Queen Street.

Enfield.—Three-storey offices, Fryfield Road; A. C. Nicholas, Ltd., builders, 232, Lavender Hill, Enfield.

Gateshead.—Houses (24), near the Causeway estate and maisonnettes (48), on the Lyndhurst estate; borough engineer.

Warehouse for Team Valley Paper Mills, Ltd.; Alnwick Construction Co., Ltd., contractors, Alnwick.

Harlow.—Tye Green South Secondary School (£300,000); H. Conolly, county architect, County Hall, Chelmsford.

Hastings.—Departmental stores, site of Gaiety Cinema and adjoining properties; Pilcher Hershman & Partners, surveyors, 74, Brook Street, London, W.1.

Haverfordwest.—Headquarters for county constabulary; county architect, County Offices, Haverfordwest.

Hounslow.—Block of shops and houses, Bath Road, Hounslow West; Cotton, Ballard & Blow, architects, Wembley Park Drive, Wembley.

Hull.—Premises, Francis Street and Caroline Place; Distillers Co., Ltd., 21, St. James's Square, London, S.W.1.

Ipswich.—Housing estate, Bixley Heath; Woodward & Lister, Station Road, Stowmarket.

London.—Office building, 2-10, Southwark Bridge Road, Southwark; Lam, Biel & Partners, architects, 16, Bryanston Street, W.1.

Jewish school, Willesden Lane, Willesden; Hearn & Dollar, surveyors, Dominion House, Bartholomew Close, E.C.1.

Special school in Elmcourt Road (£72,930), Lambeth; L.C.C. Architects' Department, County Hall, Westminster Bridge, London, S.E.1.

Maesteg (Glam).—Houses (209), Heolfain; Lewis W. Jones, U.D.C. surveyor, Council Offices.

Manchester.—New assize courts, Water Street, Deansgate (£900,000); L. C. Howitt, city architect, Town Hall.

R.C. secondary school, Greenheys; Greenhalgh & Williams, architects, 15, Mawdsley Street, Bolton.

Newcastle-on-Tyne.—R.C. secondary school at Kenton; Reavell & Cahill, Lloyds Bank Chambers, Alnwick.

Block of offices, Prudential Assurance Co., and transport depot at Benton, T. Wall & Co., Ltd.; Leslie & Co., 80, Woodland Road, Darlington.

Nuneaton. — Central area workshops (£250,000) for the National Coal Board; divisional architect, 68, Lower Parliament Street, Nottingham.

Oxford.—Laboratories, South Parks Road; University Chest, 5, South Parks Road.

Works and offices, Lamarsh Road, Botley; T. H. Kingerlee & Sons, Ltd., 35, Queen Street.

Men's college at Holywell, Great Meadow; clerk of works, University Chest, Old Town Cottage, Nuneham Park.

Reading. — Flats and maisonnettes (£500,000), Bath Road; Geo. Wimpey & Co., Ltd., 23, Hammersmith Grove, London, W.6.

Rossett (Wrexham).—Secondary modern school (£96,000); J. G. Kellett, director of education, City Road, Chester.

Stockport.—Chest clinic, Stepping Hill Hospital; Cooper Bros. & John Clayton, Ltd., builders, Catherine Street, Macclesfield.

Sunderland.—Mixed school, Farringdon estate; borough architect.

Sutton Coldfield.—Houses (70), Falstone Road; Oscott Estates, Ltd., 568, Chester Road.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).